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Pulp Removal to Prevent Periapical Infection—*Grove*

Economic Value of the Care of Children's Teeth—*Millberry*

Simple Cysts—*Endelman*

Third Molar Versus Normal Occlusion —*Morehouse*

Disease of the Investing Tissue and Its Treatment—*Coolidge*

Full Denture Prosthesis—*Howard*

Prevention of Periodontal Disease—*Bunting*

Mottled Tooth Enamel—*Wofford*

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Medical and Dental News

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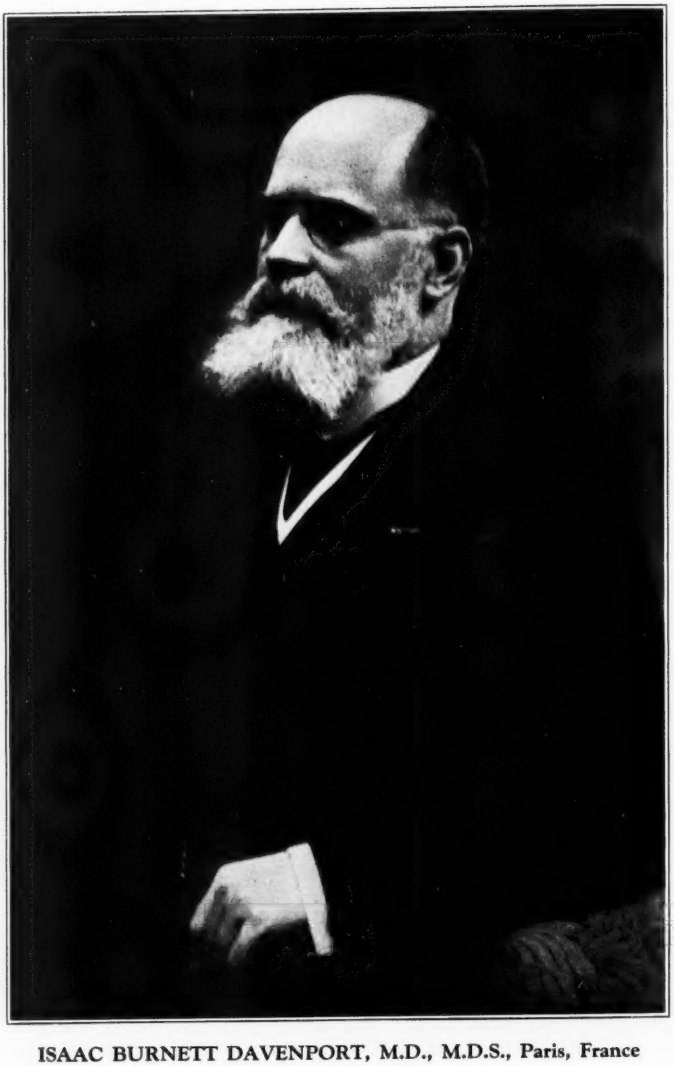

ISAAC BURNETT DAVENPORT, M.D., M.D.S., Paris, France
1854–1922

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Original Communications

A METHOD OF PULP REMOVAL TO PREVENT PERIAPICAL INFECTION

By CARL J. GROVE, Ph.G., D.D.S., F.A.C.D., St. Paul, Minnesota

(Read before the Kansas City (Missouri) Dental Society, November 13, 1922)

THE influence of periapical infection upon the general health has created in the minds of a large percentage of dentists a strong fear of the deleterious results frequently following the method of root-canal treatment now in vogue, consequently this branch of dentistry is receiving little or no attention from the average practitioner who is now extracting teeth requiring pulp removal. The close-observing dentist recognizes the fact that the artificial substitutes fail to function to the fullest degree like the natural tooth even when constructed by skilled operators following the most improved and scientific methods. It is with a full recognition of these facts and a strong conviction that successful means of coping with this perplexing problem can be attained through thorough accurate application of science, that I discuss this very important subject.

We must no longer allow ourselves to be overwhelmed by fear of the magnitude of this whole question, but must direct our efforts with a calm and sober consideration of all the truths involved, and abandon if necessary some of our long-cherished methods now in vogue. Neither must we admit defeat by adopting the teaching that all teeth requiring pulp removal should be extracted.

Why Root-Canal Operations Have Failed

I believe it is a generally accepted fact among observing members of our profession that the present methods of root-

canal operations are sufficiently faulty to be classed a failure. I am inclined to accept these views since my investigations of several thousand teeth radiographically show that more than seventy-five per cent are infected. I realize that a great number of these roots may have been infected before they were treated and filled, but nevertheless I am convinced that the practice of opening the root-canals to the apex by the use of decalcifying agents

Fig. 1

and other irritating remedies which have been used in root-canal operations are responsible for much of the infection existing at the present time.

The Pulp Does Not Pass Through Foramen

If we are to cope successfully with this problem we must view the whole question from a different angle than that now held by the average practitioner. First we must realize that the pulp does not extend through the foramen as is generally believed. The periodontal membrane folds into the foramen uniting with the pulp in the root-canal, and if the tissue that folds into the foramen is left intact, cementum will be formed to close the foramen. So far as I am aware this fact was first brought out in an article published in the July, 1916, issue of the *Dental Cosmos* where the origin of multi-canals was also explained.

As I have already stated, the supposition that the pulp passes through the foramen to the periodontal membrane, must be corrected before success can be attained in pulp removal. Attention is

Fig. 2

also called to the fact that the root-canal does not taper to the extreme end, either in single or multi-canals, but the narrowest point is at the junction of the pulp and the periodontal membrane, within the apical portion of the canal and that the foramen is divergent as is shown in Figure 1 at (a); also in Figure 2 (a) periodontal membrane, (b) root. It is from this tissue that cementum is formed to close the foramen.

The success of root-canal operations is dependent upon the preservation of this tissue. I might also state that my observations lead me to believe that only roots with vital tissue in the foramen are

free from infection, either scar tissue or cementum.

Figure 3 is a longitudinal section of a root (a-a) containing the pulp tissue at (b); note the foramen is divergent, diverging from the center toward the outer surface of the root, (c) the tissue existing in the foramen is periodontal membrane folding into the foramen. The narrowest portion of the canal is at the point of union of the pulp and the membrane at (d). This tissue contains cementoblasts like all periodontal membrane. After the removal of the pulp, this tissue is obliterated and cementum is substituted. Nature has placed tissue of this character in the foramen to make it possible to have the foramen completely closed when the pulp is removed by obliteration of this tissue and replaced by cementum. I do not believe it is unreasonable to expect repair of this character to take place since periodontal membrane exists in the foramen. It is a well-known fact that cementum is being constantly laid down on the surface of the root by the activity of the cementoblasts, and as this occurs the periodontal membrane is partially obliterated.

The cementoblasts respond very rapidly to proper influence, in the repair of the root, when covered by periodontal membrane. The cementoblasts are stimulated to activity in the laying down of cementum in the foramen upon the removal of the pulp.

Why All Pulp Tissue Should Be Removed

The importance of thoroughly removing all of the pulp, cannot be emphasized too strongly, bearing in mind however, not to injure the tissue existing in the foramen. Satisfactory results should not be expected when pulp tissue remains. I would like to make a brief report of the results obtained in this line by experiments conducted upon dogs. In sixty-four teeth operated upon where some pulp tissue remained, sixty-six per cent of these cases became infected in a period of six weeks to three months, whereas by the same method using teeth of the same dog, more than ninety-five per cent of the cases where the pulp was completely removed were free from infection.

These findings were obtained by making sections of the jaw and teeth operated upon and examined under the microscope, and not based upon radiographic evidence. My opinion is that the large percentage of infection was due to the pulp tissue remaining, as the same method, material and technic were employed for the other teeth.

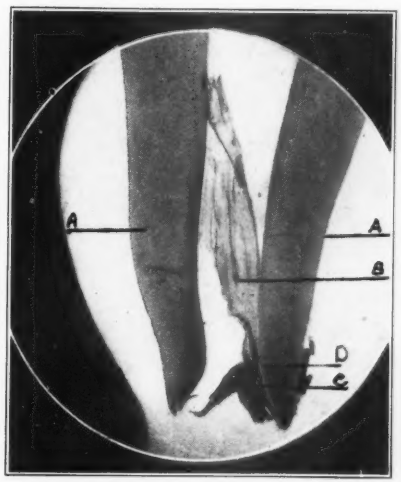

Fig. 3

In my clinical and experimental work conducted along this line, for a period of more than seven years I have failed to find any results that would justify the leaving of pulp tissue. In my opinion such practice is a most dangerous procedure. I am convinced from the result of my investigation that the successful operations of this character will be in proportion to thoroughness of pulp removal. I am at a loss

to understand why any pulp tissue should be left since we are not dependent upon pulp tissue for the formation of cementum. I have never seen a case where cementum closed the foramen when pulp tissue was left. Attention has been called repeatedly in my writings to the fact that where small portions or fragments of pulp tissue remained it was converted into fibrous or scar tissue, and that sufficient cementum was formed on the inner surface of the canal to furnish attachment for this tissue, which I believe is the only function of this cementum, not for the purpose of closing the foramen, but why have scar tissue fill the

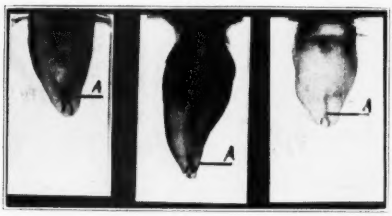

Fig. 4

foramen instead of cementum. It must be remembered that periodontal membrane folds into the foramen and that it is the cementoblasts in this membrane that form the cementum that closes the foramen. The leaving of pulp tissue is of no value in this process. Granting, however, that it was possible for pulp tissue to be replaced by cementum, why burden nature with the additional duty of replacing the space occupied by the pulp with cementum when the only result sought is to close the foramen.

The profession is just beginning to realize the disastrous results that have followed the use of remedies possessing properties destructive to periapical tissue. I believe that the practice of partial pulp removal would result in periapical disturbances almost equal to the effect of the deleterious remedies.

It must be admitted that it is difficult to always remove the pulp at its point of attachment to the membrane, but if a barbed broach of a suitable size is inserted to about two-thirds of the depth of the canal, the pulp will invariably separate at the junction of the pulp and the periodontal membrane. It must be remembered that the pulp tissue is embryonic in character and that the periodontal membrane is made up of more highly developed tissue, and since the smallest point

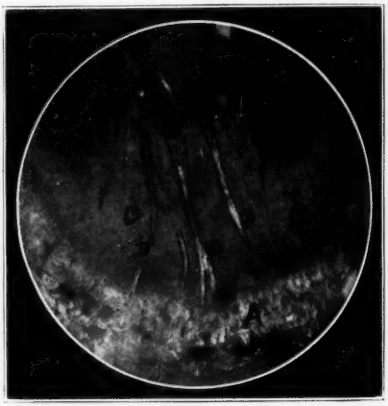

Fig. 5

of the pulp is at its attachment to the membrane it will naturally separate at this point. Figure 4 shows teeth having multi-canals. The pulp ends at the junction of the dentin and the cementum, or at the point where the branches begin at (a) (a) (a). Figure 5, multi-canals in cementum (a), periodontal membrane (b), pulp (c) (c), cementum (d) (d) (d) multi-canal. We frequently find cases where the canal is constricted by the deposit of dentin which will not permit the insertion of a broach the size which would be selected for the normal size canal. In such cases I use a very fine broach which can usually be inserted to the desired depth, and remove the pulp successfully.

Character of Tissue in Multi-Canals

The tissues existing in the multi-canals are made up largely of blood vessels with nerve tissue accompanying these vessels, but pulp tissue proper is not found.

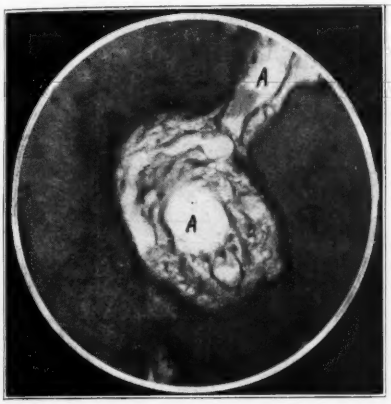

Fig. 6

Fig. 7

The general opinion appears to be that pulp tissue occupies these canals. This is not the case however. Figure 6 is a cross section of a multi-canal which illustrates very clearly that only blood vessels are present at (a) (a). After the removal of the pulp the vessels are no longer required, therefore, they are obliterated and the foramina are closed by the deposit of cementum like in single canals, as these canals also have perio-

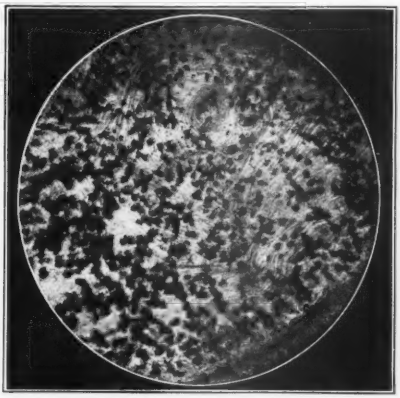

Fig. 8

Fig. 9

dontal membrane folding into the divergent foramina.

Even though portions of the vessels existing in the multi-canals should be removed with the pulp, the final results

would not differ from a case where the vessels remained.

Secondary Cementum Closing Foramen

Figure 7 is a cross section of the foramen showing a complete closing of the foramen with cementum at (a); (b) is

Fig. 10

the dentin and (c) the cementum covering the outer surface of the root.

Figure 8 is a high magnification of a portion of the cementum in Figure 7. The concentrical laying down of the cementum (a) (a) is a result of the closing of multi-canals. Note the lacuna, or the cementum corpuscle.

Figure 9 was made from an experimental case where the tooth was extracted three months after the pulp was removed. Note the circle of cementum at (a) which formed in a period of three months.

Proof That Not All Pulpless Teeth Are Infected

Figure 10 was made from a tooth extracted about six years after the removal of the pulp by the method I have advocated. There were some remnants of pulp tissue left in this case, but it has been converted into fibrous tissue. It is no longer of the embryo

Fig. 11

type. Note the fibrous tissue in foramen at (a); (b) (b) cementum has formed on the inner surface of the root-canal for the purpose of furnishing attachment for this tissue; (d) is gutta-percha point; (c) dentin. In six years' time the tissue present has not been obliterated or replaced by cementum as occurs where all the pulp tissue is removed. There is always a possibility of an infection of these tissues from bacteria which could be carried by the blood supply, where in case of a complete closure of the foramen by cementum such result is not possible. Some maintain that all pulpless teeth are infected and

that such teeth should be extracted. The fact that this tissue has remained vital for a period of six years and is free

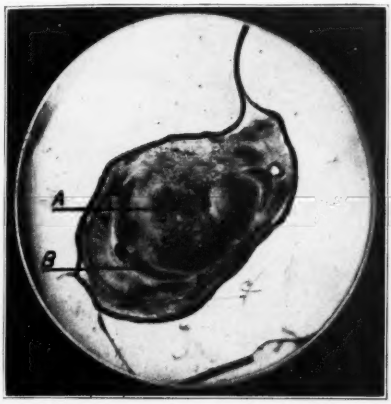

Fig. 12

from microscopic evidence of infection proves most conclusively that not all pulpless teeth are infected. I have sec-

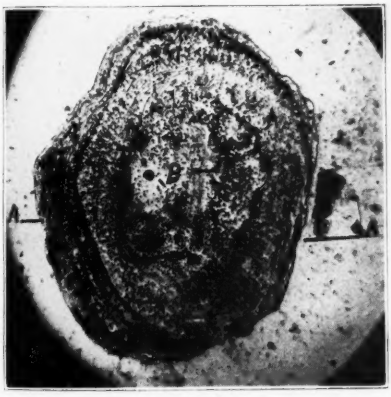

Fig. 13

tioned a great many pulpless teeth which were found to be free from periapical infection; another section Figure 11, at (a) vital tissue in foramen.

My opinion is that when a small portion of the pulp tissue is left, the foramen is never completely closed, but the tissue is converted into fibrous tissue which remains as such throughout the life of the tooth. When the pulp is all removed the closing of the foramen will follow, providing an infection does not occur.

Figure 12 is another section showing

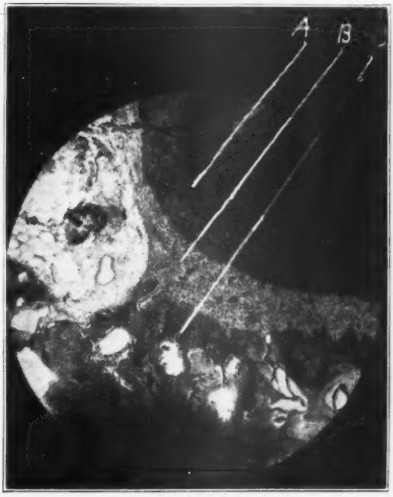

Fig. 14

the closing of the foramen (a); (b) dentin; (c) cementum on surface of root.

Figure 13 shows a complete closing of the foramen with secondary cementum at (b); (a) cementum on surface of root.

Conditions Favorable to the Formation of Secondary Cementum

I believe these illustrations serve to prove that a closing of the foramen with secondary cementum will occur in pulp removal under certain conditions. It is important to remember under what conditions such results are to be expected. First absolute asepsis in the removal of

the pulp, all the instruments including the burs must be sterile, all material inserted into the canal must also be sterile. Caries should be thoroughy removed and an attempt to sterilize the dentin of the cavity should be made before the pulp is removed. I have called attention briefly to some of the things that should be done, but it is equally important to know what should not be done.

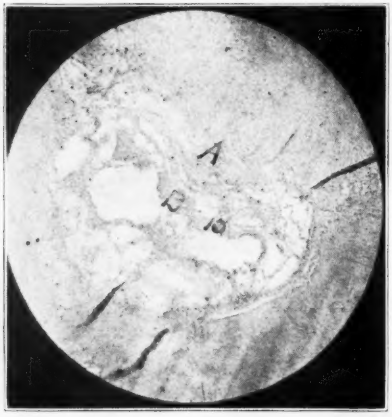

Fig. 15

Conditions Unfavorable to the Formation of Secondary Cementum

One should never use remedies in the root-canal that have properties of destroying vital tissue. I refer especially to preparations containing formaldehyde. The formalin is a gas and is very volatile, possessing properties destructive to protoplasm and as the life of all tissue is protoplasm, it should never be used in contact with vital tissue. The action of this agent upon periapical tissue can best be illustrated by showing a few pictures of the results following its use in experiments upon dogs.

Figure 14 shows the root, periodontal membrane and the bone structure surrounding a normal root end; cementum (a). Note the character of the bone tissue in the open spaces (c) contain

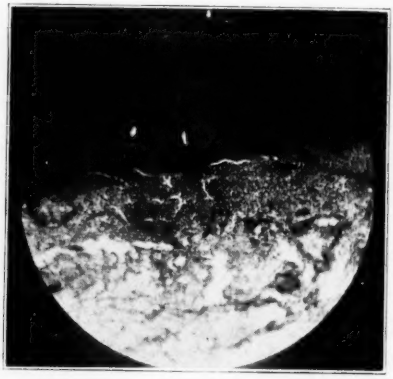

Fig. 16

medulla; (b) the periodontal membrane between the bone and the tooth structure. Note the foramen at (e). When the volatile gas passes through this opening

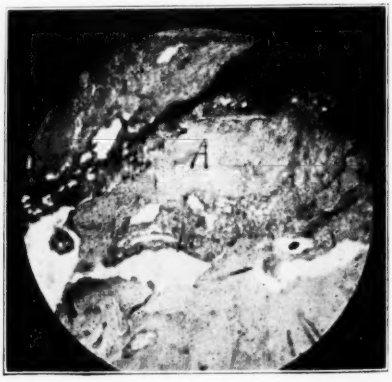

Fig. 17

a vast destruction of the periodontal membrane will result. The action of the gas is not confined to the periodontal membrane, but extends into the medullary space destroying the medulla.

Figure 15 shows the root end at (a), periodontal membrane at (b) where the formaldehyde has exerted its destructive action upon this structure. Where the destruction of this tissue has occurred, the fibers of the membrane extending into the cementum are also destroyed, likewise the cementoblasts existing in the membrane which separates from the cementum and since the cementoblasts have been destroyed we have dead cementum resulting. The attachment of new tissue to cementum of this character will never occur.

In Figure 16, (a) root, (b) periodontal membrane, note the detachment of the membrane from the root. A liquefaction of these tissues is in progress and in time the entire membrane will become liquefied, and as a result the bone immediately surrounding the root end also becomes liquefied resulting in a rarefied area.

Owing to the volatile properties of this gas, it often extends far into the medullary space adjacent to the root end, causing a destruction to the medulla. Bone of this character is largely dependent for its nutrition upon the medulla, and death results. I believe this explains the reason why we have such a great number of large rarefied areas existing at the ends of the roots. I believe this has resulted only since formaldehyde has been used so extensively. Figure 17 shows how formaldehyde has destroyed the medulla existing some distance from the root end; (a) is bone, (b) medullary space where only detritus tissue is found. I firmly believe that a large percentage of infections at the root ends have been caused by the use of this agent. Even though infection does not occur immediately following its action, the destruction of the periapical tissue produces a condition favorable to infection following at any later time. If this agent is placed in the root-canal after the pulp has been removed, death of the tissue in the foramen will follow and infection will result.

Another agent that is used very extensively, which will also cause a destruction of this tissue is acids when used in the root-canal.

Figure 18 shows what follows the use of this agent; (a) the foramen, (c) the periodontal membrane. Note the detachment at (b) (b) or the membrane from the root end. Agents of this nature should not be used in operations of this character.

Fig. 18

Why Pulps Should Not be Capped

Whenever an exposure exists I believe the rational treatment is to remove the pulp. While some advocate the capping of pulps I do not believe this can ever be done successfully.

When caries has extended to the pulp, decalcification of the dentin occurs involving the pulp; the dentinal tubule becomes disorganized which of course causes the destruction of the protoplasm existing in the tubule or of the dentinal fibril which has its attachment to the odontoblasts, or in fact, which is a part of the odontoblast. The odontoblasts now lose their attachment by severance from the fibril which would cause it to cease functioning. I do not believe the odontoblasts can produce dentin after

this separation has taken place, neither is it possible for the odontoblasts to mi-

Fig. 19

grate from the position they occupy to perform a function for their neighbor for they are attached to their present position.

Fig. 20

I do not believe odontoblasts are ever originated to replace the cells lost in this manner. I cannot conceive of how secondary dentin can be formed in these cases and it is hard to understand how the pulp can remain vital with a covering of foreign substance. I do not be-

Fig. 21

lieve the possibility of infection resulting from pulp removal is as great as where pulp capping is resorted to. I

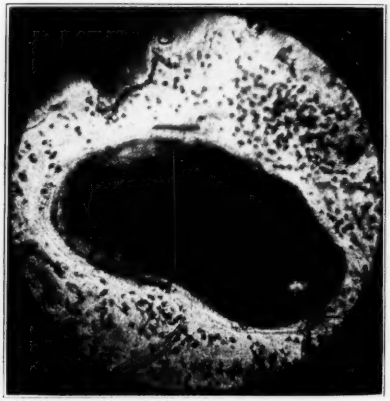

Fig. 22

would advise immediate pulp removal in all cases of exposure.

Method of Pulp Removal

The method of pulp removal that I have found most satisfactory in the

largest per cent of cases, is nerve blocking, although in cases where an exposure occurs that appears to be free from infection, I believe pressure anesthesia can be employed with safety and occasionally I find that the use of nitrous oxide is indicated.

I prefer to do immediate root filling, or in other words to fill the root at the same sitting that the pulp is removed. I have two reasons for recommending this method. First, to reduce the possibility of introducing bacteria, and second,

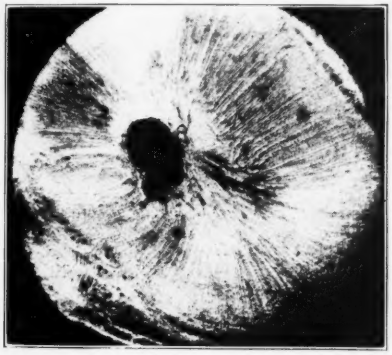

Fig. 23

to avoid disturbing the healing process which naturally follows the time between the removal of the pulp and the next sitting. The removal of the pulp, and filling of the root-canal can usually be done without even soreness of the tooth. I believe where soreness occurs, the possibility of success is lessened. While the soreness does not necessarily indicate infection, there is however, a condition present which is more conducive to infection.

I have purposely avoided dealing with a definite technic in this presentation because there are certain phases of the subject that will require more experimental work and further investigation before any change can be recommended in the aseptic technic now in vogue. I am endeavoring to unravel as rapidly as possible the problems encountered. I

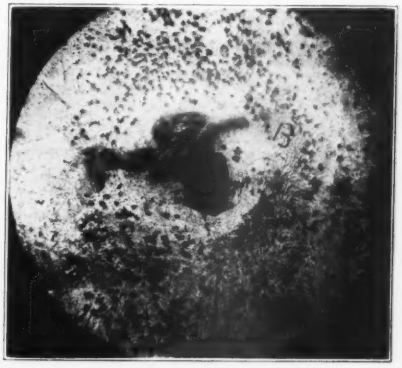

Fig. 24

make this statement because I have found that some do not seem to understand why one should present a subject unless a

Fig. 25

complete explanation is offered of all the problems involved.

A great number of dentists are using pastes containing formaldehyde for filling root-canals. I cannot too strongly con-

demn this practice, and I hope those present have gained a clear idea from the illustrations shown what will result from the use of formaldehyde in any form.

After the pulp is removed and the hemorrhage has ceased which usually occurs after a short period of time the canal should be dried as thoroughly as possible by the use of sterile cotton points. No medication should be used in the root-canal. However, it is sometimes necessary to moisten the point in sterile water in order to remove the blood stain from the inner surface of the root-canal. Now the paste should be introduced into the canal. The paste that I have found the most satisfactory is eucapercha. Now the gutta-percha cones of suitable size should be inserted into the root-canal. I would suggest however, cutting the point of the cone introduced with a gentle upward and downward motion until you are satisfied the cone is in contact with the tissue at the apex, although care should be exercised to avoid exerting sufficient force to cause trauma that would result in the death of this tissue.

Suitable Root-Canal Filling Material

These are cases that were conducted for the purpose of ascertaining which materials were best suited for root-canal filling in operations of this character. The results shown in these illustrations were obtained from experiments upon human teeth. The best results were obtained by the use of eucapercha paste and gutta-percha cones. It is difficult to explain why other pastes were not as satisfactory as eucapercha. It may be that a sufficient number of cases have not been employed to proved this conclusively. I do not therefore, condemn the other materials.

Figure 19 is made from the extreme end of a root, dentin (a) cementum on surface of root (b) cementum in root-canal (c). Note the dark substance at (d) which is part of a gutta-percha cone. It can be clearly seen how the cementum has deposited around the cone. If the tissue did not have the tolerance for gutta-percha, such results would not occur. A mass of eucapercha at (e).

The area now occupied by cementum, was originally periodontal membrane which was displaced by the deposit of cementum.

Figure 20, also shows very much the same condition. Cementum has formed in the root-canal at (a) dentin at (b) cementum on the surface of the root (c). Note the gutta-percha cone at (d). This is in close contact with the cone. The difference between the results where eucapercha paste was used or other pastes, is that the cementum did not form in some cases, neither did it lie in close contact with the gutta-percha cone.

Figure 21 shows a case where a paste containing chloroform was used. A small deposit of cementum is shown at (a), gutta-percha cone at (b) open space (c), dentin at (d).

In Figure 22 gutta-percha is shown at (a), cementum at (b), dentin at (c); also in this Figure 23, gutta-percha at (a), cementum (b).

Figure 24 shows dentin at (a), center of the field gutta-percha, cementum at (b).

Figure 25, in the extreme root end shows a deposit of cementum at (a), closing the foramen.

A Correction of Statements Made by W. Clyde Davis, Lincoln, Nebraska.

In the July, 1920 issue of the *Dental Cosmos* W. Clyde Davis has an article dealing with repair following pulp removal where he states "I have so far failed to find any statement that the cementum does or does not close the foramen." Further he states: "If anyone knows of any literature previously published bearing directly upon this point they will do me a favor to advise me."

I am indeed surprised that Dr. Davis

would make such a statement. The following are parts of my presentations upon this subject published prior to the appearance of Dr. Davis' article in addition to this. I read a paper before the Northwestern District, Iowa State Dental Society, Sioux City, in December, 1919[1] where I discussed at some length this subject showing slides disclosing the periapical conditions existing, as well as the results obtained in experiments con-

Fig. 26

ducted. Dr. Davis was present at the reading of this paper and soon after the meeting I furnished him slides bearing upon my work relative to this subject. I wish to quote my description of Figure 26[2] read in Dr. Davis' presence: "There is one thing of interest in this section to which I wish to call your attention; cementum has formed on the inside of the foramen at (d). This is undoubtedly a result of nature's attempt to close the foramen."

I also furnished Dr. Davis with a duplicate of this slide and yet he maintains that he has "so far failed to find any statement that the cementum does or does not close the foramen."

As to the search of our dental literature upon this subject, Dr. Davis states in the above mentioned article that "if any one knows of any literature previously published bearing directly upon this point they will do me a favor to advise me."

In the July, 1916 issue of the *Dental Cosmos* I made the following statement: "The question now confronts us, what shall be done with these tissues when the pulp tissue is devitalized? My opinion is that by proper treatment this tissue could become obliterated and cementum formed to close the canals; or perhaps, in some cases at least the tissue would remain vital indefinitely." My early experiments along this line, both animal and clinical, revealed to me that this method of treatment was of value. I have been engaged in these investigations and study of this subject since 1915, both clinically and experimently. Quoting further: "I have been sufficiently impressed with the importance of preserving these tissues in pulp devitalizations to deem it expedient to undertake some experiments upon dogs in order to determine the results following such treatment."

Quoting from my article published in the *Journal of the National Dental Association,* Vol. VI (1919), read before the meeting of the National Dental Association in August, 1918:

"I have conducted some experiments along this line upon dogs with a view of presenting to the profession some method whereby it would be possible to preserve the tissue existing at the apex.

[1] *Jour. Nat. Dental Assoc.,* Vol. VII (1920), No. 9.

[2] Figure 26 is a section made from a pulpless tooth. The root was filled some years previous to the extraction. Note vital tissue (a) filling foramen (b) root filling. This is not pulp tissue but periodontal membrane (d) (d) cementum lining root-canal. This tissue should not be destroyed by medicaments or mechanically when pulps are removed. Such findings prove that all pulpless teeth are not pathological.

These experiments have been sufficiently successful to convince me that these tissues will either be obliterated and cementum formed to close the foramen or the tissue will remain vital when properly treated."

Again quoting from the paper[3] I read at Sioux City where Dr. Davis was present, "I believe a preservation of these tissues is very important and will at least aid, if not prevent, infection in teeth whose vital pulps are removed. I might state that this opinion is based upon results obtained from animal experimentation. * * * The tissue in this part of the root-canal should never be destroyed or removed in devitalization." The purpose of leaving this tissue is of course, to make possible the formation of cementum.

Quoting further from the same article: "While I absolutely disapprove of pulp devitalization only where an accidental exposure of a normal pulp is made or in selective cases where decay makes exposure necessary in the excavation of decayed dentin. I believe every man here will, in course of time, do such devitalization but under aseptic conditions, and using as great care in avoiding the destruction of periapical tissue, as the extreme root-canal operations of the past were to destroy and remove all this tissue which will at least, greatly reduce the percentage of infections of pulpless teeth." These statements from my articles which are records of the dental literature published prior to Dr. Davis' writings upon this subject have a very important bearing upon this point.

In the October, 1922, issue of *Items of Interest* Dr. Davis states: "A search of the dental literature finds several references to the formation of an osteoid tissue to fill the space previously occupied by the pulp. These are in the writings of Branch (12), Tomas (8), Chase (9), Salter (10), Caush (11), Hopewell-Smith (12), and others. However, none associated this repair with pulp-canal surgery." Does not the following statements from my published presentations associate "This repair with pulp-canal surgery?"

Again quoting from my paper[4] read in Dr. Davis' presence, referring to the tissue in the foramen, "Great care should always be exercised to avoid destruction of this tissue. I believe a preservation of these tissues is very important and will at least aid, if not prevent infection in teeth whose vital pulps are removed. * * * The tissue in this part of the root-canal should never be destroyed or removed in devitalization."

Quoting from my article in the July, 1916 *Dental Cosmos:* "I have been sufficiently impressed with the importance of preserving these tissues in pulp devitalization to deem it expedient to undertake some experiments upon dogs in order to determine the results following such treatment. My opinion is that by proper treatment this tissue could become obliterated and cementum be formed to close the canals; or perhaps, in some cases at least, the tissue would remain vital indefinitely."

In the September, 1920 issue of *Items of Interest* there appeared an editorial by Dr. Ottolengui stating the following under the heading of "Dr. Clyde Davis' Research." "But we think that the researches of Dr. Clyde Davis have carried the investigation to a much more important point, and if we understand his contention, it is that if a pulp be removed aseptically, and without injury to the periapical tissue either by chemicals, trauma or the plantation of bacteria, there is a vivid possibility that the damage will be cured in a perfectly physiological manner by the closure of the foramen with secondary cementum."

Even in July, 1916, November, 1917, and August, 1919 issues of the *Journal*

[3] *Jour. Nat. Dental Assoc.*, Vol. VII (1920), p. 768-770.

[4] *Jour. Nat. Dental Assoc.*, Vol. VII (1920), p. 768.

of the National Dental Association and in the July, 1919 issue of *Dental Cosmos* I called attention to the fact that these tissues should be preserved in order to make it possible for cementum to form to close the foramen. It should be remembered that I brought out these facts as early as 1916, yet Dr. Ottolengui maintains that this is "Dr. Clyde Davis' Research."

Again repeating statements I made at

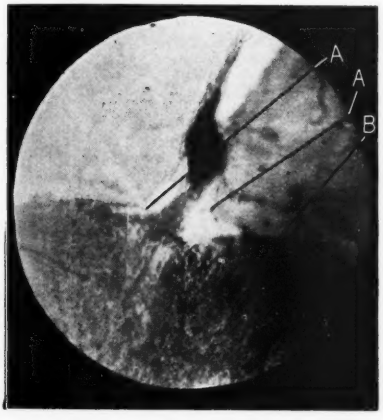

Fig. 27

Sioux City in Dr. Davis' presence December, 1919[5], referring to the removal of the pulp: "Great care should always be exercised to avoid destruction of this tissue. Under strictly aseptic conditions, and using as great care in avoiding the destruction, of periapical tissue, as the extreme root-canal operations of the past were to destroy and remove all this tissue. I will show a slide, Figure 15[6], where a forty per cent solution of sulphuric acid was used in a root-canal of a dog where a destruction of this tissue has occurred (a) (a)." In the *Journal of the National Dental Association* for November, 1917, Figure 5, was shown an illustration disclosing the action of formalin. "Remedies that have properties of destroying vital tissue should not be allowed to come in contact even with cementum."

In an editorial in the January, 1923 issue of *Items of Interest*, the following statement appears which I wish to correct although this was not included in my discussion at Kansas City since it appeared after the meeting: "Finally arrived Clyde Davis, who tells us that many teeth in which a part of a living pulp had been left, are shown first by the radiograph, to have been retained with healthy apical surroundings; and secondly, that upon extraction and sections and microscopic examination the foraminal regions are seen to have been obliterated with deposits of osteoid tissue. * * * That this phenomenon is possible is admitted by Grove." I do not admit, as stated by Dr. Ottolengui, the possible phenomenon of the closing of the foramen by cementum where a part of the living pulp has been left.

As a matter of fact I have never recommended leaving a part of the pulp tissue. I regard this a most dangerous practice. However I have called attention to the fact that when the pulp is completely removed the foramen does close by a deposit of cementum. This is not a corroboration of Dr. Davis' work but discoveries that resulted from my own investigations long before Dr. Davis' writings upon this subject, as is proven by the statements in the following.

If Dr. Ottolengui will refer to the *Journal of the National Dental Association*, August, 1919, and in the October, 1921, *Dental Cosmos*, Vol. LXII, No. 10, he will find the following which are my views regarding the question of leaving pulp tissue. "My opinion is that the more thoroughly this is removed the greater will be the measure of success accompanying these operations. While

[5] *Jour. Nat. Dental Assoc.*, Vol. VII (1920), p. 769.

[6] This slide is reproduced in Figure 27 on this page.

it may appear at first thought that in time the fibrous tissue existing in the canal (meaning pulp tissue that has been converted into fibrous tissue) will be replaced by cementum, my observation leads me to believe that, where conditions exist as shown in this section, the canal is never completely closed with secondary cementum."

I have shown in Dr. Davis' presence that where living tissue existed in the apical portion of the root-canals that "microscopic examination" disclosed that the periapical tissue was free from infection. I have also shown "by the radiograph" that roots fairly well filled have a smaller percentage of periapical infection than roots filled to the apex, first in December, 1916, in the *Dental Cosmos* and many times since, also in Dr. Davis' presence.

In the paper[7] presented at Sioux City in the presence of Dr. Davis I stated: "I will show a slide, Figure 9[8], taken from a section of one of these teeth showing the tissue in the apical portion. There is no evidence of the action of bacteria. I realize that many investigators assert that they obtain strepticoccus from the roots of all pulpless teeth, and advocate their removal because of such findings. If bacteria exist at the apex of these teeth, the periodontal membrane surely would be involved sufficiently to show some pathology."

[7]*Jour. Nat. Dental Assoc.*, Vol. VII (1920), p. 766.

[8]See Figure 26 in this issue.

The following is quoted from the *Dental Cosmos*, Vol. LXIII, No. 10, October, 1921: "I have prepared sections from a great number of pulpless teeth and found the periapical tissue free from pathological disturbance. If infection were present in these tissues the bacteria would be active, thus producing a destruction of the tissue. The fact that no change has occurred is conclusive evidence that such teeth are not infected."

In 1915 I worked out a method for disclosing multi-canals which has been published in our dental literature at various times. In the study of these specimens prepared by this method, I realized through the knowledge thus gained that a more intimate knowledge of root end tissue was essential for the successful treatment of teeth requiring pulp removal. As the desired knowledge was not available in the dental literature I immediately began to section teeth for the microscopic study of root end tissue.

One of the first things of value that I observed in the histological study of these slides was that the pulp tissue did not extend through the foramen as the subject matter contained in our text books implied. So far as I am aware the fact that the periodontal membrane unites with the pulp in the apical portion of the root-canal, was first brought out in my work upon this subject. However, if the supposition is not correct I will gladly withdraw my claim.

THE ECONOMIC VALUE OF THE CARE OF CHILDREN'S TEETH

By GUY S. MILLBERRY, D.D.S., San Francisco, California

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

THAT the teeth are valuable organs, no one will deny, but how valuable they are is a debatable question. Arguments ranging from those presented by the individual, who having lost a half of one tooth, believes the dental arches are wrecked, or who, having suffered the destruction of the periodontal membrane covering an area of five square millimeters on a lower first molar, believes all of his teeth will soon be lost, to those presented by the octogenarian "gumming it" through life and still able to do a fair day's work, who believes that teeth were always a source of trouble and discomfort, offers an opportunity for argument. The subject presupposes definite values or comparative values, difficult to analyze though perhaps capable of proof.

We must therefore adopt a premise for purposes of discussion. The dental organs and surrounding tissues have several definite values, the three foremost being in their respective order; function in the mastication of food, esthetics in appearance, and utility in speech. Depending on the presence or absence of any or all of the teeth, in part or in whole, healthy or diseased, are these three values normal or impaired.

The deciduous teeth which parents generally and so many of our profession specifically look upon as "only baby teeth," have in the light of our more recent understanding come to be considered as of great value. Why? Because they play such an important part in the general physical development of the child. Their value can easily be demonstrated as factors in bodily growth and mental attainment by a comparative study of cases or case records. One need only contrast the child with defective, uncared for, irregular teeth with the one with sound teeth who has had routine personal daily care and periodic professional service and instruction to arrive at a definite conclusion regarding values.

The deciduous teeth have an additional value in direct relation to the normal periodic eruption of the permanent teeth for the latter physiologic change is largely dependent upon the norm of the deciduous dentition.

Applying the three values mentioned to the deciduous teeth, the first—function—is most important. The gradual change in diet during the normal period of retention of these teeth and the physical changes which take place resulting from this change in diet, demand a perfect set of teeth and the proper use and care of them. Perhaps no period in our lives is so important in laying a health foundation as that period between the ages of

six months and twelve years. I dare say that all parents having children would prefer to know that they had been in perfect physical condition up to the age of twelve, than to know that they possessed superior mental attainment and a defective physique. While appearance and the ability to express themselves properly are not so important in childhood, they constitute great physical and mental handicaps if the defects are such as will become permanent or cause childhood associates to comment or criticize, thus producing a derogatory psychological effect on the individual.

With the completion of the permanent dentition, the child begins to assume a place in the economic world. A certain percentage of children at the age of from twelve to fourteen enter the field of productive industry. Their success depends very largely upon sound teeth and a healthy mouth, and by success I refer to results of human achievement in every walk and station in life. The boy or girl with sound teeth, a clean mouth and healthy gums is much more likely to be employed in commercial, industrial or professional fields than one who lacks these necessary adjuncts to health. I believe the time is not far distant when the requirements of compensation insurance laws will make it necessary for employers to reduce hazards in self-protection by insisting on a sound or restored dentition before employment is given.

So minor an injury as that caused by a toothpick jammed into a septal space, with a portion of its fibres remaining, thus causing an acute painful inflammatory condition, may mean the loss of hours or days of valuable productive time to the individual and perhaps the loss of products needed by the public.

An aching pulp may produce similar results with the additional loss of money necessary for the corrective service; alveolar abscesses or pyorrheal conditions reduce the general vigor of the individual, lessen his productive power, and increase the hazard of susceptibility to infectious disease or organic impairment. These are some of the well-known causes of debility and consequent economic inefficiency.

No data are available giving comparisons of costs during periods of illness and good health in family or institutional budgets, but a casual review of any of them shows that expenditures for medical and dental service must be included. We must draw our deductions then from statistical evidence gathered elsewhere and from case data coming to the notice of the observer. Personal experience justifies the general statement that all people are better off financially when in a reasonably normal state of good health. The same inference would hold good if applied to the occupants of any public or private institution, the maintenance of which is provided for by taxation or philanthropy; the people who work pay the bill in either case.

It only remains to prove that ill health and the resultant inefficiency is directly traceable to dental disorders to carry the point in this argument.

Fones's reports and those emanating from St. Vincent's Orphan Asylum in Boston, both of which are freely quoted all over the civilized world, show that a reduction in the prevalence of dental disorders will reduce the percentage, if not wholly eliminate the prevalence of other diseases, the quality and quantity of the food supply being adequate.

A recent report[1] shows that in a study of 200 school children from seven to fourteen years of age, who were treated

[1] *U. S. Public Health Reports*, April 21, 1922, pp. 929 to 945.

for physical defects, (67.5 per cent being dental defects), the average gain in weight was 200 per cent greater than the normal gain before the correction was made, and the average gain in height was 100 per cent greater during the same time, so we must conclude that the correction of remediable defects is commendable.

How can we deduce an economic value from these health statistics? Let us compare scholastic results with costs of education. Of the one hundred forty-six children who remained on the roll during the entire survey, all but nine, six-tenths of one per cent were promoted. Of these one hundred forty-six children, sixty-three or about forty-three per cent were over age for the grade, and had repeated from one to four grades prior to the survey and service.

From other sources, we learn that in the larger cities in this country, the cost of education per pupil, per year, ranges from $75.00 to $134.00. If we can reduce the percentage of repeaters in the schools from forty-three per cent to 0.6 per cent, at the costs above mentioned, it must mean an economic saving to the community.

Another analogy from the industrial world may add some proof to the argument. During 1921, the National Cash Register Company in Dayton, Ohio, expended about $73,000.00 in its medical and dental departments. As a result, they saved in the time of their five thousand employees an average of forty hours per year, valued at fifty cents per hour, resulting in a saving of $100,000.00, or a net profit of $27,000.00 during the year.

I was advised by the physician in charge that this department is no longer considered a welfare department but a part of the business equally as important as manufacturing, sales, or any other.

The value of a man or woman in a community can hardly be estimated in terms of dollars or cents. We can, however, estimate the cost of maintaining people who are in ill health in our city and county, and our private hospitals.

Aside from the general maintenance costs, it usually requires the labor of one healthy person to care for one person in ill health in any well-conducted hospital.

Again, it has been reported that only one-fifth of our population constitutes the productive members of society, the children, the aged and infirm, representing the larger portion of the remaining four-fifths. However, we must not lose sight of the fact that the producers must provide all the funds for carrying on the world's work and any effort we may expend in reducing the costs of ill health and resulting inefficiency will either reduce the costs or improve the standards of living.

Above all, we must remember that happiness is more important than wealth and it does not exist in ill health. If we were to accomplish nothing more than to make people happy in our health campaign, we are working for a good cause. Our greatest hope lies with the children. Our greatest opportunity is in the schools. Are we ready to carry on?

Discussion

Will C. Wood, (Superintendent of Public Instruction, Sacramento, California). There are some sidelights, perhaps, which I may throw upon the subject, because, as Dr. Millberry says, after all, it is a problem of education. It is a problem of reaching the boys and girls, teaching and training them in ways that will prevent this economic waste which he has emphasized.

In our schools the chief physical problems of the children are problems of the head. Between 65 and 70 per cent of the defects which are found among the boys and girls of school age are defects of the teeth. In addition to that we have defects of the eye, ear, nose and throat. Adenoids and similar defects taken with defects of the teeth and

the eyes bring the total "head" defects up to ninety to ninety-five per cent of all physical defects among boys and girls. I think I am underestimating rather than overestimating the total "head" defects. What are we going to do about it? When we discover the defects in school, the school authorities in our better school systems consult a physician in case the defect is of the eye, ear, nose and throat. In like manner we should send the child to a dentist in case he is suffering with defects of the teeth. This is done in our best school systems. We send the child home with a note to the parents stating that the teeth need attention. In a great number of instances the parents attend to the teeth or have them attended to by the family dentist. In a considerable number of instances, however, especially among the poorer people we find that there is no response. What are we to do with cases of this kind?

In various places in California, under a recent decision of the Supreme Court, school departments have organized a dental clinic or employed a school dentist who treats the teeth of children of indigent parents. It seems to me that after all, the big problem is prevention. I was very happy indeed to catch that thought in Dr. Millberry's paper. We need to prevent the development of defects. How are we going to do it? Various efforts have been made to teach prevention of teeth defects but, usually the arrangement has not been made properly to secure the best results. Education is the educator's problem. We don't welcome, in our schools, any authority outside of our boards of education. We don't welcome an attempt on the part of the board of health or of any other board to step in and attempt to handle a part of the children's education.

It is simply a matter of proper administration. Frequently attempts made to teach children have failed because the agency employed has not been the proper agency. I believe that we should approach the problem of dental hygiene in the school through the organization, in connection with the school department, of an adequate, well equipped and well supported health and development department or division. At the head of this department should be a physician and at the head of the division of dentistry, a dentist. We should have experts in charge of all health work, having it understood that people in the health division or department of school work are employed by the school department and are working under the direction of the school officials. After all, education is the province of the school. Health work, dental clinics, dental hygiene—all these have been introduced that the education of boys and girls may be improved. It is not a problem to be handled by a bureau of any other division than the educational division of the state.

What can a local bureau or division of the school do for the economic welfare of children in the matter of teeth, and what can a state bureau do? First of all I have indicated what can be done in the way of treating the defects that have been discovered. What can these bureaus do in the way of education in means of preventing tooth defects? Some attempts in this direction have been almost ludicrous because of the fact that people attempting to teach and train in oral hygiene do not understand children. For example, I have seen them attempt the pantomime, "This is the way I brush my teeth, brush my teeth, brush my teeth." The idea being that we can teach children to brush their teeth by "make-believe" methods. I want just to call your attention to one thing: Girls have been singing, "This is the way I wash my clothes, wash my clothes, wash my clothes," for hundreds of years, yet girls are not washing clothes with as much grace and willingness as they did several centuries ago. In other words, pantomime doesn't get very far in teaching children. There is only one way to teach them, that is teach them actually to take care of their teeth. In other words, mouth hygiene has to be practiced. When it comes to brushing teeth, instead of going through the motion, pantomime fashion, the thing to do is to show the child how to use a toothbrush on his own teeth with real water and tooth powder. This means individual instruction, which can be given under the division of dental hygiene in the schools.

Then, of course, there is the problem of cleaning the children's teeth—a very important problem which can be taken care of in California through our dental hygienists, who are with us, because of the fact that Dr. Millberry saw to it that dental hygiene for school children was provided for in the law, with dental hygienists to carry out the scheme.

The economic value of children's teeth is very great. I agree with Dr. Millberry that it is difficult to measure the economic value of the teeth. If some child in school has

defective teeth, what is the effect on him? First of all, there may be pain connected with it. The effect on the child is not only physical but also psychological. Who can estimate the value of the time of the children that is lost because of the fact that the children are suffering from defective teeth? Then, too, there is the economic loss due to the pouring into the blood stream of poisons arising from defective teeth. Who can estimate the effect of that on the life of the child? I believe we should recognize that the life insurance companies who have emphasized the value of dental hygiene and the teaching of dental hygiene, after having made a study of the economic factors involved, are competent to advise us with respect to the economic losses due to defective teeth. They emphasize the fact that we should give more attention to the teaching of dental hygiene.

Finally, may I say that giving children information about their teeth doesn't go very far. It is training, not telling, that counts. We should train our children to care for their teeth continually. The schools can do this successfully even with the vast numbers of children that come from homes of various types. It is largely a matter of organization and zeal in the cause.

Dr. Millberry, (closing): In the discussion, Mr. Wood has very ably presented the viewpoint of the educator. His wide experience ranging from the school room to the supervision of the public school system of California is indeed helpful to those who are interested in the public health movement.

The problem of preventive dentistry can be compared to the maintenance of way and of equipment of the railroads. No railroad today would permit its road bed to go to pieces or its trackage or rolling stock to become defective with resultant wrecks and damage suits, yet the dental profession generally has waited until complete renovation of wrecked mouths was necessary before proceeding with the work. Especially does this apply to children's work.

To use an Irish phrase, we must prevent the decay of the teeth before it begins. How are we going to do it? Personal instruction is undoubtedly the most valuable for the influence of the thirty-minute conversation with the child on health matters, clean hands, clean clothes, clean mouths, fresh air, wholesome food, is perhaps the most valuable part of the dental hygienist's service. The toothbrush drill is relatively as helpful as a recitation in mathematics, and equally few children are interested. The drill, however, does have a disciplinary value, just as military or gymnastic drills do, when all pupils are performing in unison.

I am very glad that Mr. Wood has a sincere personal, as well as official interest in this problem and, as Superintendent of Public Instruction, his interest will produce a marked change for the better in the health of our school children of the present generation. If we can secure as much cooperation in other states, our dental health program will be a simple problem.

SIMPLE CYSTS TYPE A: DENTAL CYSTS

By JULIO ENDELMAN, M.S., D.D.S., F.A.C.D., Los Angeles, California

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

THE classification of cysts of the jaws into simple cysts and adamantinomas and the division of the former group into simple cysts type A and simple cysts type B, seems to be less misleading than the more elaborate classification advocated by some investigators. In this short research the etiology, pathologic anatomy, symptomatology and treatment of the simple cyst type A have been studied.

Etiology

These cysts, also known as dental cysts, root cysts or radicular cysts, are in the nature of neoplasms traceable to some source of irritation which may be bacterial or mechanical. They are the most commonly encountered intraosseous cysts. They are found associated with pulpless teeth in which the sterilization and filling of the root-canal has been incompletely carried out. But they may also be found in connection with teeth containing vital pulps; however, only teeth whose periodontal membrane has for a long time sustained mechanical irritation of a mild order. Teeth in various degrees of malocclusion are the ones likely to become the seat of these cystic developments. They vary in size from those one-eighth of an inch in diameter to those one inch in diameter and in rare instances they attain even greater dimensions. The characteristic feature of these cysts is their epithelial cell content about which some interesting investigations have been carried out, prominent among which must be mentioned the work of Malassez in 1885, of J. G. Turner in 1898 and Sir John Bland-Sutton in 1888 and 1911. An understanding of the histological relations of the enamel organ to the follicular wall is essential in the study of the etiological aspect of this problem. It was observed by Malassez the epithelial cells—in some instances chains of these cells—were found in and adjoining the periodontal membrane. These cells could be derived from various sources, from the epithelial lamina, from the epithelial cord and from the extension of the enamel organ into the follicular wall which is the developmental antecedent of the periodontal membrane and persists as such throughout the life of the tooth. More recent investigators lean toward the acceptance of the most plausible of these various sources, namely the sheath of Hertwig or the extension into the follicular wall of the co-mingled cells of the internal and external layers, the stratum intermedium and the stellate reticulum of the enamel organ.

Pathologic Anatomy

The simple cyst type A for purposes of description may be divided into four parts, to-wit: 1. The cystic cavity; 2. The internal wall; 3. The intermediate structure; and 4. The external wall.

The Cystic Cavity

The cystic cavity varies in size from the smallest conceivable size to a size equivalent to from approximately one-

third to two-thirds of the average diameter of the cyst. The formation of the cystic cavity has been explained on the assumption that the agglomeration of epithelial cells in the center of the developing cyst suffer from a degenerative process eventuating in their liquifaction, as the result of nutritional interference by mechanical obstruction. The cells in the center of the epithelial mass liquify following an autolysis traceable to the disturbed metabolism of the cells. The epithelial cells bordering the cystic cavity show the evidences of the degenerative process; their outlines become irregular, the nuclei disappear and the protoplasm assumes a granular appearance. The cystic fluid consists of serum albumen, serum globulin, water cholesterin crystals and cells in various stages of degeneration.

THE INTERNAL WALL

The internal wall has been found in our research to consist of one or more layers of epithelial cells resting upon an under-structure of connective tissue fibers—a portion of the external wall. The epithelial cells are but loosely attached to the connective tissue fibers underneath, but firmly attached to each other. In the preparation of selections not infrequently the epithelial cells will become detached from the external wall in a chain-like arrangement. The epithelial cells are extremely irregular and vary in size and form; some are round, distinguishable with difficulty from the ordinary round connective tissue cells, some are oval and some columnar.

The nuclei occupy the center of the cells and, except where the cells are undergoing a degenerative process, they are clearly visible. When undergoing degeneration, the nuclei are in some cells shrunken and in others they have entirely disappeared, the cell appearing as a cytoplasmic mass of gelatinous structure.

THE INTERMEDIATE STRUCTURE

The intermediate structure is that portion of the cyst extending from the internal epithelial lining to the dense connective tissue wall of the cyst externally. We have observed that this intermediate structure is less dense than the external wall and apparently less resistant to infections than the external wall. In specimens wherein the evidences of chronic infections are to be seen, the external wall appears clear or the seat of comparatively slight inflammatory reaction. There is no definite line of demarkation between the external wall and the intermediate structure.

THE EXTERNAL WALL

The external wall is a relatively thick fibrous layer consisting of white connective tissue fibers arranged in a circular fashion and encircling the cyst on all sides except at the point of attachment to the periodontal membrane. The origin of these fibers is from the fixed white fibers of the periodontal membrane stimulated to reproduction by a continuous but mild irritation. As the cyst increases in size it may become detached from the tooth. It is this thickness of wavy fibers which accounts for the more or less definite outlines of the cyst when viewed in a radiogram.

REACTIONS IN THE ADJACENT CANCELLATED

The reactions in the adjacent cancellated bone-structures are of atrophic nature. Under the influence of the pressure upon the surrounding bone tissue from the growing cyst, osteoclastic activity is stimulated and the cancellated spaces are gradually made wider by the collapse of the bony septa. The smaller cysts give no external evidence of their presence; the larger specimens show externally by a bulging of the outer osseous layer which may become so thin as to readily yield under slight pressure producing a peculiar crackling sound, a sensation

known as "parchment crackling." Subperiosteal bone formation occurs externally, but as the rate of bone formation is slower than the rate of bone absorption, it happens that the bone overlying the cyst becomes very thin, as the cyst increases in size, or it may completely disappear, the cyst lying in a position with the overlying mucous membrane.

Symptomatology

In the beginning of its formation the dental cyst is diagnosable with difficulty and then exclusively by radiographic means. The mucous membrane at first shows no indication of its presence but as it increases in size a bulging of the overlying alveolar plate will be in evidence and the mucous membrane will appear congested. The smaller cysts do not give rise to subjective symptoms of any kind; the larger cysts may cause pressure symptoms or becoming infected may give rise to symptoms suggestive of an accute or chronic periapical infection. Clinically, the symptoms of an acute or chronic periapical infection are undistinguishable from the symptoms of a cyst which has become infected by bacteria giving rise to reactions of corresponding degrees of intensity.

Treatment

The early recognition of simple cysts type A is of considerable importance inasmuch as upon their removal possible future complications will be averted. Recently there came under our observation two cases of dental cysts. One which had doubtless originated in the periodontal membrane of one tooth, increased to a size necessitating the extraction of the central and lateral incisors, cuspid and the two bicuspids on one side and the other beginning between the central incisors required the extraction of these teeth and of the adjoining lateral incisors. The treatment of dental cysts is of course exclusively surgical.

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Discussion

Joseph Copp, Los Angeles, California: I should like to ask what would be the prognosis in the treatment of cysts of the type shown on the screen.

Julio Endelman, Los Angeles, California: Several factors have to be taken into consideration, namely the condition of the periodontal membrane, the patient's resistance, and the health status of the individual. If the cysts are not large, and a successful enucleation had been done, there is no reason why regeneration should not occur. The question of bone regeneration is one of total elimination of the infection. I think I have proven that.

Dr. Hopkins, Milwaukee, Wisconsin: I would like to ask a question as to the primary cause of these cysts, whether you think it is a mechanical or bacteriological irritation—while they are lined with epithelial cells supposedly from, as you say, the sheath of Hertwig—whether primarily the basement membrane was broken. Isn't it supposed that in the formation of teeth that there is a basement membrane upon the peripherial layer of enamel. In speaking of those cells floating around in the periodontal tissue, wouldn't it have to happen that some mechanical irritation or some cause would have to remove the epithelial cells from the inner surface and bring them out to form those nests of ephithelial cells? I mean, would there be such irritation during development of the teeth, or whether the cysts might be caused later by some mechanical irritation.

Dr. Endelman (Closing): I have seen these cysts both in connection with teeth with septic root-canals and teeth in which the pulps were normal. In the latter instance the irritation was traceable to some form of malocclusion. But without some irritation being present, mechanical or bacteriological, I can hardly conceive of these cysts developing.

THIRD MOLAR VERSUS NORMAL OCCLUSION[1]

By H. L. MOREHOUSE, D.D.S., Spokane, Washington

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

ORTHODONTIA has advanced in the past twenty years by leaps and bounds. Scientific theories have been advanced, mechanical appliances improved until we have no excuse from that direction but I fear we have overlooked the chief cause of our failures especially in Class II cases and quite often in Class I.

Dr. Hatfield of Boston said before the American Society of Orthodontists at Atlantic City last year; "Any man who has practiced orthodontia long enough to have observed the end-results, will find an evitable proportion of failures which could be labelled somewhat as follows: Classification correct, diagnosis incorrect, prognosis disappointing, unfortunate, fatal or something to that effect." I would be a little more liberal and say: classification and diagnosis correct, an unseen enemy not reckoned with, result disappointing, unfortunate or something of that nature.

We have all had many cases which we have released after long retention and upon meeting the patients six months or a year later have noticed the anterior teeth showing signs of crowding and have concluded we were not as much of a success as we thought we were. These are some of the cases to which Dr. Hatfield referred. If these cases are radiographed they reveal to us the impacted third molar with its feet against solid rock, so to speak, exerting more force in endeavoring to erupt than our beautifully occluding teeth can overcome.

Leonardo da Vinci says, "There is no result in nature without a cause; understand the cause and you will have no need of the experiment."

Dr. Rogers of Boston has given us some food for thought and study in the treatise on "Muscle Training" which I feel is going to bear much fruit in the future.

Histologists have given us the laws for the development of the human body; how the tooth germs are given off and their growth but they only deal with the normal conditions and leave us to work out our own salvation when nature slips which it does so many times in its deposition of tooth germs.

In order that a clearer understanding be had of this third molar influence, I wish to recall some of the forces which we find working at an early age and continue in three stages throughout the child's development.

The first is the stimulus and growth started by the development and eruption of the deciduous teeth which give us the child's jaw.

The second stage is the beginning of development and eruption of the first permanent molar in its process of eruption which starts the first stimulus in

[1]In February, 1918, I presented a paper on "Third Molar Influence in Orthodontia Cases" before the Pacific Coast Society of Orthodontists which was the first written on the subject with Radiographs as proofs.

the development of the adult jaw and is in full occlusion at about the sixth year with the second permanent molar taking its position in its crypt and adding a

Fig. 1

like stimulus. I think records will bear me out that seldom if ever, is the germ of the first or second permanent molar found in an abnormal position for eruption. This is easily explained when we realize how rapidly the forward development of the jaw is taking place at this time. The growth forces seem to

Fig. 2

slacken about the eleventh year under normal conditions so by the time the second permanent molar is ready to erupt a year later, there is nearly a complete check in the process and I think the growth anteriorly is about completed.

The third step is the development of the third molar with no particular bearing on the growth of the mandibular or maxillary arches as I will try to show.

Before taking up the question of the action of the third molar I wish to call attention to an action occurring earlier. In the maxillary arches of our Class II (Angle Classification), cases of both divisions but especially Division II, I feel that the buccal teeth are forced mesially by forces starting about ten years of age through the developing second permanent molar and assisted by tardy eruptions of perhaps the cuspids

Fig. 3

or second bicuspids as the case may be, resulting in the impaction of one or the other, usually the second bicuspids. In those cases the period of slowing down in the process of mesial development has occurred at an earlier age about eight or nine years instead of eleven or twelve, according to the child's physical development (Figs. 1, 2 and 3).

The germ of the third molar is under way in a territory that is not as advantageous to a successful termination as its brothers; in the maxillary arch it is found high up and usually mesially of its normal position for eruption which means that as it moves downward it will act as a wedge between the teeth anterior to it and denser bone distal to

it, causing, if there is the slightest delay in eruption of any of the buccal teeth, a mesial movement of the first molar and

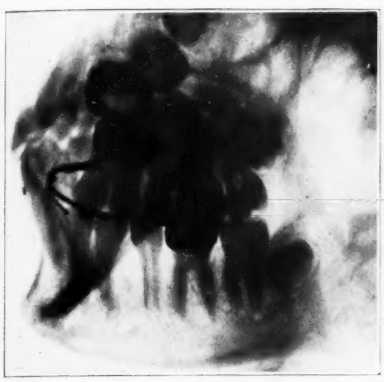

Fig. 4

a Class II, Division II case is formed or if the delay occurs in both of the jaws, our classification would be a Class I with impacted cuspids or bicuspids (Figs. 4, 5 and 6).

Fig. 5

The same thing applies in the mandibular arch only to a more aggravated extent for a much denser bone is found at the junction of the ramus and mandible than in the maxillary arch and added

to this is the mechanical angle of the jaw, making almost impossible in more than fifty per cent of our cases, the

Fig 6

normal deposition of the third molar germ to say nothing of the eruption of the teeth without something giving way and that usually is a beautifully cor-

Fig. 7

rected arch. This will occur even in cases that have been fortunate enough to have normal occlusion without mechanical assistance (Figs. 7 and 8).

The lower third molars are found in much denser bone at the junction of the

Fig. 8

ramus and mandible and for this reason the germ when it first makes its appear-

Fig. 9

ance will be found to be deposited at such an angle as to make it impossible for it to grow into anything but an impacted position. In very few cases where the radiographs show the third

Fig. 10

molars, especially the lower ones just forming, will there be any change in their angle later (Fig. 9).

Some writers contend that this stimulation by the third molar is necessary for

Fig. 11

the mesial development of the jaw. I have some slides which will show splendid anterior growth where there are no thirds at all and one where there are not even any lower seconds (Figs. 10, 11 and 12).

We also must realize in the consideration of this subject that evolution to a certain degree has exerted its influence.

Nature's forces are governed in their deposition of bone by the needs of the individual or animal according to the service for which the parts in question are to be used. We know from the study of comparative anatomy that where nature finds more development necessary to strengthen certain parts, there it increases its activities and vice versa. Thus we conclude that due to our high state of civilization, that the use of the

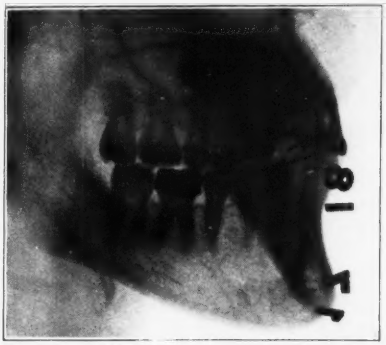

Fig. 12

jaws has become less and less until we find considerable shortening over past generations which partly accounts for the lack of room for the proper development of the third molars.

I am convinced, that this anterior development occurs slightly before and up to twelve years of age and that the impaction is due not to a lack of proper growth but because the germ at the time of deposition is influenced by some force, which I will not attempt to explain, and starts on a wrong angle. Thus started, it continues to grow in the same direction, first because in the mandibular arch just anterior to its position is the more cancellous bone of the alveolar process and because above and behind is the denser bone of the ramus preventing any attempt to right itself. In the maxillary jaw, impactions are not so frequent, the

Fig. 13

bone in that region not having quite so much density.

I feel that impactions of the upper third molars are most often due to a

Fig. 14

misplaced germ, that is, the germ is deposited farther mesially than it normally should be, so that when the upper teeth are moved even the slightest degree

distally, it acts as a fulcrum and causes an impaction. The conditions and causes in the two jaws are different.

I cite a case in which I have been holding the retention for three years to see if the position of the thirds could be made to change. I think you will agree that I have lost in the game. There was no distal movement necessary in this case at any time yet note the impaction of the upper third. This case was first treated at five and a half years and followed up as the permanent teeth erupted (Figs. 13 and 14).

Fig. 15

Whenever impacted lower third molars are discovered, I feel that they should be surgically removed but not before the fifteenth or sixteenth year, according to their development as shown in the radiograph. In the case of the impacted upper third, I have found in most instances it is better to extract the second allowing the third to take their place.

Figure 15 is a case, Class II, Division I, of a girl fifteen for whom no x-ray was taken until the later part of the treatment, disclosing the condition shown. Here two actions were taking place; the lower thirds were locked distal to the seconds, forcing the first and seconds into position of supra-occlusion; the upper thirds were badly impacted above the seconds making it impossible to get normal mesiodistal relation. I had the upper seconds extracted and the lower

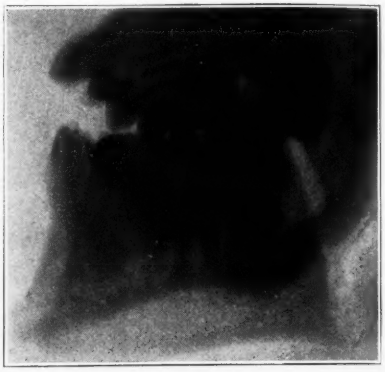

Fig. 16

thirds removed and there was no further trouble experienced.

Figure 16, Class II, Division II, case shows trouble only in the lower in which

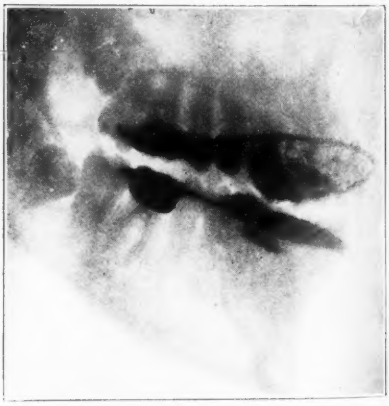

Fig. 17

the thirds are causing supra-occlusion of the first and second molars, giving the effect of infra-occlusion of the rest of the teeth. The worst of this case was that

it did not develop until six months after retention and then the parents delayed having the lower thirds removed until the tissue had been built beneath the other molars, with the result that the case had to be retreated as one of infra-occlusion in the incisors.

Figure 17 is of a Class I case which during treatment developed a supra-occlusion of the first and second lower molars, the cause of which is clearly

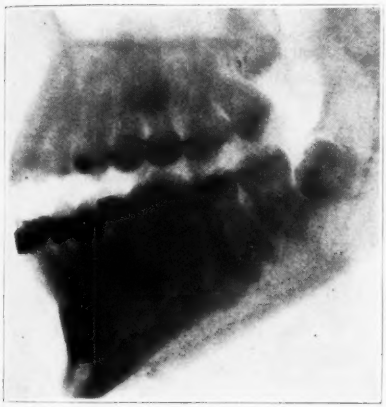

Fig. 18

shown in the x-ray but unlike the second case, the lower thirds were removed at once and the appliances left off for about three months with the result that the teeth settled back to normal themselves and have given no further trouble.

Figure 18 is of a Class II, Division II case mutilated on one side with an unerupted upper second premolar in position, but the operation of opening the space for the unerupted tooth complicated the impaction on that side. It also shows a badly impacted lower third. These lower thirds were causing a movement mesially of all the lower teeth. I had both lower thirds removed, also the upper right second and no further trouble is anticipated.

Discussion

Hugh G. Tanzey, Kansas City, Missouri: It has been shown that possibly intermaxillary elastics might be the cause of many impactions. When we realize there are millions of these cases and that intermaxillary elastics are used in only a small per cent of the total number, it will be difficult to account for the remaining majority on that theory. Then too, sixty per cent are neutro-occlusion cases, where intermaxillary rubbers are not used, so that it could not apply there. I am of the opinion that appliances could cause the backward tipping of the second molar teeth and interfere with the eruption of third molars.

I think the impaction is not due to displacement of the germs of the teeth themselves, but due to an arrested development of the maxillary bones, that causes the malocclusion of the teeth. We cannot resort to extraction always, and we should attempt to treat or prevent this condition of arrested development of the bones where the teeth are set. To do this, begin early in life by getting expansion, doing everything possible to secure development of the bones.

John R. McCoy, Los Angeles, California: Four years ago at the meeting of the Pacific Coast Society of Orthodontists, Dr. Morehouse gave his first observations on the subject of third molars which was somewhat new to me at that time, and I believe was new to others. Several years ago a case was referred to me from New York, the patient being about fifteen years of age. A feature of the trouble was an "open bite." The suggestion was made by the orthodontist referring the case that I have a "skull cap" constructed for the child, with a view to overcoming the "open bite" by bending the lower jaw into position. It seemed rather a novel suggestion to me. However I had radiograms made of the jaws and learned that at the early age of fifteen the third molars were starting to erupt. The bite was "open" three-eighths of an inch at least. I sent the radiographs to the New York specialist, who did not agree with me that the third molar which was not impacted had anything to do with the difficulty. At any rate I allowed the tooth to erupt, and in a few weeks time the "open bite" was overcome.

In another case a boy's teeth were corrected at ten years of age, and good results were secured. He was dismissed at the age of eleven years. Radiographs showed impacted third molars, and I advised their extraction as I believed they would elongate the second molars. He returned at seventeen with a bad "open bite". (nearly one-half inch—one of the worst I have seen) caused by the elongation of the second molar. I again ordered the ex-

traction of the impacted third molars. Their removal was very difficult. I adjusted the appliances, and in a short time the "open bite" was overcome and the lower incisors were placed in normal position, as they had overlapped considerably as a result of the third molar pressure.

In another more recent case a child was sent to me because of trouble at the time of eruption of second upper pre-molars. They had erupted lingually to normal. The child suffered from sinking spells during the eruption of these teeth. The Mayo clinic had observed the condition, and had ordered the arches enlarged to accommodate the teeth. The child was frail and we had to go very slowly. During treatment considerable "open bite" occurred. On making radiographs the third molars showed impaction, and the second molars were considerably elongated on account of that condition. Before we could get these third molars out this little girl of fourteen was admitted to the insane ward at the County Hospital. She is improving now, and as soon as she gets rid of those impacted teeth I believe her condition will be entirely relieved.

I am convinced that unless we give proper consideration to third molars the end results of many of our cases will be unsatisfactory.

Philip T. Meaney, Portland, Oregon: In the cases Dr. Morehouse has shown I should like to know what relation intermaxillary rubbers might have had on the positions of the upper third molars? I would like to know if the mesial movement of the roots of those upper teeth were the result of distal movement probably in an endeavor to carry the lower teeth forward, i. e., the effect being to force the crowns of the upper third molars distally. I should also like him to say whether he has had cases under observation only, in which he found similar conditions prevailing. I should like to know whether or not a third molar exerts its greatest pressure at the time of development, or at the time of its eruption. Does it do most damage when its contact is more nearly normal, or at the time of development? Is it better to extract these third molars, developing under unnatural conditions, at an early age, or wait until as near eruption time as possible?

H. C. Pollock, St. Louis, Missouri: Several months ago I chanced to have a discussion with a man who has probably done more work on third-molar impactions than any other man in the country. He has classified the impacted third molar in a manner similar to the classification in orthodontia several years ago. He said while he did not have scientific data accumulated and at hand, after twenty years' experience he was coming to the conclusion that the Baker anchorage, as used by orthodontists may be responsible for the displacement of third molars, particularly in mandibular cases where this form of anchorage had been in use a year or more.

From some of the work of C. O. Simpson on cases having been under orthodontic treatment we have seen the lower molars and buccal teeth tipped distally exerting their influence on the third molar. I have seen several cases of this kind recently. These points that have been brought out by men who are in position to know something about the third molar, are most interesting.

H. F. Hoffman, Denver, Colorado: If the orthodontists will systematically radiograph their cases, observe and report results, the time will not be far distant when we will have some basis on which to form a definite conclusion. I have been radiographing cases for the past six years. I am not prepared to make any dogmatic statements as to what will or will not happen under certain circumstances. I believe that intermaxillary force is responsible for the impacted condition of many third molars. I do not know that however, but it is certainly reasonable to believe it, and the observation of a large number of radiographs convinces me it is probably true.

The best evidence I have of the influence of the third molars upon the development of the mandible is one case of a young woman with an extreme Class II displacement, which yielded to treatment very nicely. About that stage she went to a hospital for the removal of her tonsils. She had four third molars. The uppers were badly decayed and were erupting abnormally. She spoke about her third molars to her surgeon and at the time he operated on her tonsils he removed the four third molars. That case relapsed, and I could never again get it to respond to treatment. I believe that the body of the mandible was shortened and further development prevented by the removal of the third molars.

A. H. Ketcham, Denver, Colorado: I wish to make a plea for thorough radiographic surveys of the mouth at the time the patient presents for consultation. This is as much a part of the preliminary work and diagnosis as are models of the case.

Dr. Hoffman in speaking of intermaxillary ligatures, brought to my mind two Class II cases in which impaction of the lower third molars has been relieved by the development of the mandibular arch secured through the assistance of the intermaxillary ligatures. One case was that of a boy of thirteen in which the radiograms showed that the crowns of the lower third molars had formed and were in badly impacted positions. On one side of the mouth the distal surface of the lower second

molar was about on a line with the ascending ramus, and on the opposite side the mandible was almost as short. I recommended the extraction of the crowns of these lower third molars. This was not done and a year and a half later radiograms revealed the fact that the mandible had developed until there was room enough between the distal surfaces of the second molar and the ramus to allow for the eruption of the third molars, and they were turning upright and about to erupt normally.

Replying to Dr. Tanzey's inquiry: "Do you believe in the early extraction of these impacted third molars?" will say, I am on the fence. I have advocated the early extraction of impacted third molars. The other day Dr. Young reported two cases referred to an oral surgeon, each for the removal of an impacted lower third molar. In the first, the crown alone had formed. Considerable difficulty was experienced in its removal on account of the crown rolling in the crypt. The second case, with a similar impaction, but having root formed proved to be a less difficult operation. On the other hand, some of my oral surgeon friends, as well as dental radiologists, have reported that in some cases which were operated upon for a heavy impaction show in radiograms a considerable area of loss of bone, and sometimes later radiograms show that this area has not been filled in by a secondary deposit of bone. Thus the jaw is weakened at this point. I think we have to use our common sense in these cases—perhaps extracting in one instance, and not in another.

Dr. Morehouse (Closing): Drs. Meaney and Pollock asked practically the same thing, as to the question of the Baker anchorage (intermaxillary ligatures), causing impactions. Dr. Ketcham has answered that very clearly, but if we do not take our radiographs early we cannot tell how much complication has occurred. Had they been made before commencing treatment the third molar would have been found mesial to its normal position for proper eruption. In the majority of instances I do not feel the Baker anchorage causes impaction. It complicates it, but it does not cause it.

It is difficult to answer Dr. Meaney's second question. Dr. Young brought out the thought that possibly with the fluids in the crypt, the pressure in the developing tooth germ might cause a stimulation, although the third molar was not in contact with the second. I always felt there was an action in the developing third molar germ that causes the mesial movement of these anterior teeth; but just what that cause is I have not determined. As you know where there are impacted cuspids and second bicuspids there is no question at all that the molars have been moved mesially and they certainly will not move mesially unless there is some force to accomplish it. The positions of the first, second and third molar germs have been mesial at the outset and the teeth erupted in those positions. If radiographs were made at an early stage followed by additional ones from time to time I think we will usually find most of the troubles are due to the deposition of the tooth germ out of its normal position.

As to the arrested development in the maxillary arches, mentioned by Dr. Tanzey, we admit that the present mode of living has caused a considerable shortening of the jaws of the human race. While that is so it may answer possibly the question of the mesial position of the tooth germ in its early deposition, but I do not think it answers the question of impaction, only so far as the first and second molars may be in normal position in Class I cases. Even in those cases we will find a mesial deposition of the upper third molars in a great many instances. Dr. Ketcham says the lower third molars may be improved by the Baker anchorage if the angle of the third molar is such that it will allow the tooth to slip past the gingival roll of the second molar, but in the majority of those cases it is tipped to such a degree that a still more complicated impaction results.

SOME OF THE COMMON CAUSES OF DISEASE OF THE INVESTING TISSUE AND THEIR TREATMENT

By EDGAR D. COOLIDGE, D.D.S., Chicago, Illinois

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

FORESIGHT is the ability to project one's thoughts into some future period and to see things in their proper proportions at that time; to recognize the influences as they appear and to sum up the effects they will have upon conditions at this future period. There are insignificant influences that sometimes turn the tide of following events into entirely different channels from that in which they would flow unguided. So it is with health or disease of the supporting tissue of the human teeth. Nature has built up a wonderful arrangement of tissue of a highly specialized character to provide a masticating apparatus. For the support and protection of this machine it has been surrounded by investing tissue; a highly vascular tissue composed of alveolar process, fibrous tissue epithelium and various structural elements.

It has been the custom ever since dentistry has been practiced to treat the diseases of the investing tissue *after* they have occurred. In fact most of the practice of dentistry has been reparative and perhaps there will always be a demand for this service. However, the need of reparative dentistry is, to a large extent, an evidence of neglect and failure to *prevent* disease.

We are now living in the age of prevention and the old saying that "an ounce of prevention is worth a pound of cure", is receiving more consideration than ever before. Great industrial leaders recognize the economy of appropriating funds for providing the very latest and best means of protection against accidents and sickness among their employees, and much emphasis is given to every detail of hygiene both general and oral to maintain the greatest degree of health and efficiency possible. Dentistry has been justly accused of attacking its greatest problem from the rear. Instead of getting at the very beginning of the trouble and discovering and eliminating the causes of the diseases with which it has been dealing, it has developed skillful operators and splendid methods of practice to repair or replace lost teeth. This is not because there has been a lack of interest taken in the teaching of students of dentistry but rather because of the great demand for dental service, and the most attractive field for service has been that of repairing and restoring. At the present time the demand for service which will prevent disturbances of the normal health and function of the mouth and teeth is becoming very urgent. The public is awakening to the value of such service and is seeking it not only of

those who make it a special field of practice but from the general practitioner as well.

The Gingival Tissue

The tissue surrounding the neck of the teeth, that portion of the gum tissue which is termed the gingivae, bears a most vital relation to the teeth and their protection while they remain in position. It is described as having a body, a septal crest and a free gingivae. The body of the gingival tissue rests upon the alveolar process and gives form and support to the septal crest and free gingivae. The septal crest is that part of this tissue which rises between the necks of two teeth and is roofed over and protected by the contact of these teeth. The free gingivae is the thin, pink edge or extremity of the soft tissue which rises, and hugs the neck of a tooth. It is this portion of the tissue which is the first indicator of danger to the health of the supporting tissue.

There are three groups of muscle fibers contained within this tissue which forms a part of the periodontal membrane. One group, called the alveolar crest group, passes from the cementum to the crest of the alveolar process which encircles the tooth, passing through the body of the gingivae at the neck of the tooth forming a very strong elastic band. This group of fibers supports the tooth against lateral force. There is another group of fibers which passes from the cementum of one tooth through the body of the gingivae to the cementum of the adjacent tooth which is designated as the transeptal group. The third group of fibers pass from the cementum outward and crownwards to form the free gingivae and give them their elasticity and support, causing them to hug the neck of the tooth lapping up well over the enamel and rising close to the contact as the septal crest in the interproximal space. Covering this mass of tissue and forming nearly one-third of the bulk is the epithelium which is so characterized that it will stand considerable abuse and injury from which a very rapid recovery is made owing to its abundant capillary circulation even to its very surface.

The Subgingival Space

As the free gingivae lap up against the enamel on the neck of the teeth, there is a space left between their free margin and the cemental attachment of the muscle fibers of the free gingivae group. This space, the subgingival space, is the place where the cause of a large per cent of gingivitis is located. It is here that the first deposits of serumal calculus occur and unless they are detected and removed early after their formation they cause a low grade inflammation which soon starts pathologic changes in the entire gingival tissue and results in the detachment and loss of these bundles of muscle fibers and the absorption of the alveolar septum.

The Cementum and Alveolar Process

The cementum, which is the bone-like structure that covers the root, affords attachment for the principal elastic fibers. Lying among the fibers close to the surface of the root are the cementoblasts whose function is to continually form cementum over the root attaching the ends of the small bundles of elastic fibers of the periodontal membrane to the root. As long as the gingivae are normal these cells perform their function of forming layers of cementum and reattachment of accidentally detached tissue may be brought about. Under conditions of continuous mild inflammation however, the elastic fibers undergo a change; they stretch and break loose from the cementum and the cementoblasts disappear. This is the beginning of pocket formation in the periodontal membrane. When the

cementoblast has disappeared there is no longer any means by which reattachment of the tissue may occur.

The alveolar process is built up around the root and furnishes attachment for the other end of the fiber bundles of the periodontal membrane. It is dependent upon this attachment and when the inflammatory changes of continuous gingivitis take place and the groups of elastic fibers of the gingivae begin to stretch, loosen and disappear, the crest of the alveolar process begins to absorb away and instead of its normal high, sharp crest it presents a blunt, cut-off appearance in the radiogram. The alveolar process cannot be restored to its original position after pathologic absorption takes place as the cementum has become pus-soaked, preventing reattachment of the principal fibers. The tooth has lost this support for all time and further changes and loss of tissue follow more easily because of the loss of this protective tissue.

Causes of Gingivitis

Our greatest study of this subject was done by the late G. V. Black and his text book on "Special Dental Pathology" is a monument to his genius. He stated that "a gingivitis precedes the pericementitis in every case and in view of what has been said relative to the lack of power of reattachment of the periodontal membrane to the cementum, it is of the utmost importance that we pay more attention to the earlier lesion, the gingivitis, which can usually be prevented or cured by very simple means." Because the conditions which cause a gingivitis are simple they are ignored or overlooked in many instances and suppurative pericementitis follows. As has been stated before it seems that often these danger points are not recognized until the disease has reached a stage where the tooth is nearly ready for the forceps.

The principal causes of gingivitis may be summed up under one heading with several sub-heads. Injuries of some kind which are slight but keep up a continuous irritation seem to be at the beginning of most gingivitis.

Salivary calculus is perhaps one of the most common causes of gingivitis but not as disastrous as many other causes. This deposit gathers on the necks of the teeth principally near the mouths of the ducts leading from the salivary glands in the form of a soft deposit which hardens and grows from a beginning point until it is dislodged. The effect upon the gingivae is to cause a slight surface irritation followed by a slow absorption of tissue with seldom any pocket formation and very little suppuration.

Serumal calculus found upon the enamel under the free margin of the gingivae in the subgingival space, can be detected by the explorer. Usually the gingivae will present a red or blue appearance just over the position of this deposit. The area is usually very slight and easily overlooked. If the deposit is allowed to remain it causes a continuous irritation and progressive inflammation of the gingivae followed by detachment of the fibers from the cementum.

The accumulation of food and debris between teeth with faulty or open contacts is one of the most serious causes of gingivitis because of the possibilities of much tissue destruction. Where food wedges between teeth there is always some force driving it there and upon careful examination it will usually be found that the opposing cusp is so located that it brings a wedging force between the two teeth. The occlusal surface form and the proper interproximal relation is often abnormal or improperly restored by filling or artificial crown. Where the marginal ridge is omitted and flat fillings are placed there is no mechanical form to prevent food from wedging in between teeth even though they have good contact.

Friesell[1] states, "if the proper form

[1] *Items*, (1918), p. 978.

of a tooth be maintained in its marginal ridges, height of contour and contact points, the most prolific cause of periodontal disease will be eliminated". Close observation over many years will convince one of the truth of that statement. The form of the tooth should be such that it will afford protection for the margin of the gingivae from the impact of food in mastication and where there is a deviation from that form there is usually gingivitis as a result.

Abnormal occlusion usually causes a continuous gingivitis some place in the arch if not at several places. The loss of the first molars, especially the lower first molars, is invariably followed by the moving and tipping of the second and third molars and very frequently by the separation of the bicuspids. A very large per cent of these cases develop a chronic gingivitis and in later years suppurative pericementitis follows. Any malposed tooth is liable to be the cause of gingivitis because of the improper relation of the teeth in occlusion and the wedging of food either around the malposed tooth or between the opposing teeth. Stillman[2] correctly states that, "the symptoms of occlusal trauma are to be observed in mouths perhaps years before the resistance of the investing structure have become so lowered that they become a prey to infection." Unbalanced or uneven occlusion of either natural or artificial teeth is a very frequent cause of gingival and pericemental inflammation. As the wear of mastication progresses, undue stress is often found bearing on a single tooth causing it to move slightly when the teeth are in occlusion. Such cases require careful examination to detect and locate the high portion of this tooth or its opposing mate. These teeth are not troublesome in mastication but when the mouth is empty and the teeth are brought into occlusion, greater stress comes upon one tooth than the others causing a slight movement of that tooth to accommodate the occlusal force. The annoyance without serious pain to the patient causes a desire to bring frequent pressure upon that slightly elongated tooth ever aggravating the condition. This tooth may be complained of by the patient as being sore or may not be spoken of at all until it becomes quite loose. When such movement is produced there is a stretching of certain fibers and a compression of others and a closing of some spaces with the opening of other spaces. This effect as explained by Noyes[3] is that, "the vessels in the closed spaces are constricted and the flow of blood through them partly shut off. The vessels in the enlarged spaces dilate to compensate. If the force is removed the dilated vessels are again constricted and the constricted ones enlarged, and the result is a literal sawing upon the walls of the blood vessels which in a very short time will set up acute inflammation."

Abrasion comes in as a frequent contributing cause to gingivitis. The teeth wear down, as middle life comes along, losing in some places the rounded buccoocclusal or labio-incisal line angles of the lower teeth or the linguo-occlusal line angles of the upper teeth. The wear may fall upon the marginal ridges also in such a way as to produce sharp line angles along the proximal surfaces. By carefully locating these places and observing them for a period of time it will be found that a chronic gingivitis persists directly beneath these sharp line angles. The food is shorn off quickly by these sharp edges and drops directly down upon the free margin with sufficient force to keep up a gingivitis even though the contact may seem good. This loss of tooth form allowing the forcing of food along the surface of the tooth irritates the free gingivae and soon

[2]*Dental Cosmos*, (1918), p. 324.

[3]*Dental Histology and Embryology*, p. 270.

deeper lesions follow and infection of the periodontal tissue progresses.

There are other common causes of gingivitis some of which reflect upon the workmanship of our profession, which should be so constantly spoken of that they would be eliminated—the overhanging margin of fillings and inlays and the poorly adapted crowns or ill-fitting partial plates, all of which are unnecessary. Frequently a filling is placed without proper separation of the teeth which leaves a loss of mesiodistal width of the interproximal space and a pinched condition of the septal tissue results. The most valuable service is given when all such preventable defects are carefully corrected and eliminated from the mouth. *The time to render this service is when such operations are being done and not after years of chronic gingivitis have started more serious changes in the periodontal tissue and suppuration has begun.*

The Progress of Gingivitis

The progress of gingivitis varies in its rapidity and destructiveness. Infection never begins in the healthy gingival tissue but develops where gingivitis is present. Every recurrent infection increases the inflammatory reaction and further changes of tissue follow each reaction. The products of infection and inflammation are carried off by the lymphatic vessels which have two courses according to Noyes[4], "the collecting vessels from the labial, buccal and lingual surfaces of the gums and gingivae pass outside of the periostium of the alveolar process to the wreath of collecting trunks at the reflection of the tissue from the surface of the bone to the lips or cheeks on the outside and to the collecting trunks of the floor of the mouth and palate on the inside." Secondly, "the collecting vessels from the papillae lining the gingival spaces penetrate the ligamentum circulare very close to the cementum and *extend* into the interfibrous tissue accompanying the blood vessels and nerves, *through the periodontal membrane* as far as the apex of the root where they anastomose with the efferent vessels from the dental pulp." Briefly stated, these waste products from the inflammatory center of gingivitis are carried off outside the periostium into the collecting trunks of the lips, cheeks and floor of the mouth but from the inner surface of the gingivae the course of the lymphatic channels is down through the periodontal membrane close to the cementum along with the blood vessels. This carries the inflammation deeper into the tissue with each recurrence of infection and the periodontal membrane becomes involved and changes progress and absorption follows with loss of attachment. This explains why there is so little formation of pockets where heavy salivary calculus deposits are present as the irritation is almost entirely on the outer surface of the gingivae from which the inflammatory products are carried off outside the alveolar process and the infection is not carried through the periodontal tissue.

The Treatment of Gingivitis

The treatment of gingivitis is often a very simple matter after the cause of the trouble is known. It requires a considerable amount of study and thought and observation before one can locate these areas and diagnose the reason for the trouble. It may require several sittings to find the cause of an area of gingivitis, and only a few minutes to correct it, after having discovered it. It is a thing one has to force oneself to do, often times, as other seemingly large troubles are always crowding in for attention.

A definite plan or system of examination and recording is very essential in this work. It is my custom to make a

[4] *Dental Histology and Embryology*, p. 270.

complete record of all conditions found and chart them at the first sitting of the patient. This record is kept on file for reference during the treatment of the case. When the treatment is completed the record is filed away and at each future examination of the patient it is brought out for comparison.

All gross conditions such as missing teeth, crowns or bridges and large artificial restorations are recorded first; then such general conditions as the kind of occlusion, the condition of the teeth whether susceptible or nonsusceptible to caries, abrasion and erosion, the general condition of the mucous membrane and gingivae and the condition of hygiene of the mouth. Next, a detailed examination of the gingivae on each surface of every tooth is made, and all areas of gingivitis recorded together with the cause of the trouble as far as can be determined at once. It may be salivary calculus, serumal calculus, an open contact, an improper contact from malposed tooth or abnormal form of tooth or faulty contact of crown or filling, imperfect margins of fillings, inlays, crowns or perhaps an improperly fitted partial plate, etc. These various things are recorded by numbers as suggested by A. D. Black.[5]

Study models are made of all cases that present areas of gingivitis that are not easily understood. Sometimes full models of each jaw and sometimes only a wax bite of a small area is made and models poured and articulated. These often reveal the cause of one of the most dangerous kinds of trouble. It is often found that a cusp is wedging between the two opposing teeth or that heavy stress is bearing improperly on a single tooth, causing injury to the soft tissue by the constant impact of occlusal force. To accommodate occlusal force this tooth must be forced down into the tissue compressing the vessels and other tissues and when the pressure is relieved the tooth is slightly raised again as the vessels expand. It is a simple matter to find the high spots by means of articulating paper or a paste made with lamp black and vaseline as suggested to me by Bricker of Rochester, Minnesota, in his splendid clinic on this subject. This paste is placed on the tooth that shows the most wear, keeping the tooth dry, then having the patient close gently and the opposing tooth will show black where the occlusal force first strikes. All such places are then ground down until the occlusion is evenly balanced, the grinding being done upon the tooth which does not show wear instead of further grinding the one which shows an inclination to wear down.

A complete radiographic record is made and carefully examined for absorbed areas in the alveolar process especially between the teeth. Many times the radiogram will call attention to areas which might easily be overlooked by any other method of examination. Where gingivitis has progressed to the stage of suppurative pericementitis the radiogram becomes absolutely necessary in every diagnosis. The depth of every pocket as found with the explorer is recorded on the chart and compared to the radiogram to check up each method and attempt to arrive at a clear understanding of the condition as it exists about that particular tooth.

After having scaled and polished the teeth, which is done at different sittings to allow the injured gingivae to recover and return to normal before dismissing the patient and offers an opportunity to check up each area to see that the calculus has all been removed and other causes of gingivitis corrected, the patient is instructed as to when it would be advisable to have further care. If the patient requests it a definite appoint-

[5] *Special Dental Pathology*, p. 453.

ment is made for the future and a notice is sent in advance.

While the work has been underway the patient's interest has been aroused in the daily care of the teeth. This must be emphasized by all dentists and instruction given nearly every patient in the proper method of brushing the teeth. Various methods of brushing are recommended but the result is what we desire regardless of the method. If the patient fails it is our duty to show where the mistakes are made and how to correct them. Instruction as to the causes of the deposits and their period of formation will arouse the interest of the patient and when they understand this they will make a greater effort to correct their method of brushing. The method described by Charters[6], is the only method by which I can satisfactorily clean my teeth. The bristles must be forced into the interproximal spaces to remove the deposit on the proximal surfaces in order to properly clean them and by his method it can be accomplished.

Conclusion

In conclusion I wish to re-state that one of the most valuable types of service is the one which prevents the diseases of the periodontal membrane. The early recognition of gingivitis and the full realization of the possibilities of its development along with an understanding of the manner of its development should be the duty of all who practice dentistry. The extensive cases of pyorrhea which present for treatment, and are often considered to be of constitutional origin through faulty diet and organic disturbances effecting these changes in the periodontal membrane, are so far beyond the time of initial gingivitis that the local contributing causes cannot often be positively determined. It is noticable that in practically every case of any stage of periodontal disease whatever, only several localized areas of the trouble are to be found and not a uniform progression on all teeth as might be expected from a purely constitutional condition of the fact that the state of nutrition and the reaction of the entire organism against destructive influences are an important consideration when dealing with transient tissue there is no doubt, but let us look a little closer to these local conditions before they are beyond control. An early recognition of the loss of the septal crest of the alveolar process is an important point and should be considered as a sign of approaching disease. Every effort should be made to check the progress of this condition. Gingivitis is not distressing to the patient, yet each year it becomes more difficult to correct and to check its effects on the deeper tissue. G. V. Black[7] stated that, "there is no more promising field for study and practice of prevention than in the group of conditions which are the exciting causes of the inflammation of the gingivae." This should not be left for the few who devote their entire time to the treatment of the periodontal tissue but should be the duty of every practitioner of dentistry. As the leaders of industry have recognized the economic value of prevention and are developing this service among their employes so must we as a profession realize the importance of it, and take every opportunity to teach our patients to value it and to appreciate the great benefit that will accrue to them in years to come if they will co-operate with us in every possible way.

Discussion

J. F. Biddle, Pittsburgh, Pennsylvania: No doubt many of us examining the mouths of the laity as well as of many members of our own profession, cannot but observe the destruction of the investing tissues of the teeth, due to faulty restorations in the construction

[6] *Jour. Nat. Dental Assoc.*, Vol. VI (1919), p. 279.

[7] *Special Dental Pathology*, p. 125.

of fillings and crowns, and deplore the lack of discrimination and foresight that governed their insertion. In other words, the operators have not considered abortive measures nor reconstructions, which would have prevented the conditions which frequently confront us; the loss of the interproximal tissue, the alveolar process, and in many cases, the loss of great areas of the periodontal membrane and even of the tooth itself. The field of preventive dentistry in all its phases is just as attractive as reparative dentistry and offers even greater opportunities of accomplishing the greatest good.

The importance of the study of tooth form is inestimable and is justly one of the most valuable divisions of college training. The dental student, no doubt, wonders why he must carve the various teeth from ivory blocks and bring out every lobe, ridge, and sulcus with mathematical precision, but could he but look ahead into the future and see the incalculable damage resulting from the lack of such procedure, he would cease to wonder and would devote himself untiringly to the task of mastering every detail of tooth anatomy.

The scheme of dental procedure today is certainly for the better. Formerly an operator at the first appointment of a patient examined his mouth to determine how many cavities could be found. Today, however, the first procedure is to note conditions of soft tissues; if abnormal, is it attributable to malocclusion, destruction of tooth surface, or deposits of calculus under gingivae? May it be due to mechanical interference, such as the use of tooth picks, pins, incorrect use of toothbrush? May it be influenced by occupation of patient, or due to the use of drugs? X-rays are used to great advantage in the study of gross destructive changes, which occur in the investing hard and soft tissues, which have been caused by faulty contacts and lack of restoration of teeth to their natural form.

After one has taken a complete history of the case, and has diagnosed the cause of the trouble, it is then time to repair the damage by the removal of the cause, but it is more important to recognize these conditions in their incipient stages, and by abortive measures, plan to avoid much future trouble. In medicine, as in dentistry, the ability to observe the earliest symptoms of pathological conditions and to treat them, is the greatest service that we can render to humanity.

Frederick A. Bricker, Rochester, Minnesota: Dr. Coolidge says, "It has been the custom to treat diseases after they have occurred." I surmise that this custom remains to a large degree; at least, one is led to this conclusion after listening to a lengthy discourse on the merits of proprietary remedies, and seeing the names of 9,000 dentists used as a testimonial for a single remedy which assures a cure of the disease, periclasia, but does not remove the cause. In spite of this, we are informed that we are living in the age of prevention.

I place special emphasis on abnormal occlusion as a predisposing cause of gingivitis; this factor is frequently underestimated. If we study occlusion carefully, we find that the wear caused by the act of mastication changes the line of force from normal to abnormal, especially in patients over thirty-five years of age. This abnormal wear is due, I believe, to our present diet. Malocclusion has come to play a tremendous part in the prevalence of periodontal diseases.

Dr. Coolidge has mentioned the constitutional phase of dental disease. I have found that patients with a history from the internist of disease conditions, such as diabetes, nephitis, anemia, high blood pressure, and constipation, have a lowered resistance in the gingival tissue, making that tissue more susceptible to bacterial invasion. Many extreme cases of gingivitis, in which there is no tartar or poorly fitting restorations, are due to unhygienic dentistry. Another source of chemical irritation is the bacterial plaques at the gingivae.

I agree with such authorities as Carter, Howe, Mason, McCollum and McCann that diet plays an important part in the origin of periodontal diseases, and I firmly believe that more time and thought should be given to this aspect of the subject.

Dr. Coolidge's method of examination and recording is excellent. I would suggest filing the radiograms with the history chart for future reference.

I would place special emphasis on the education of the patient in the daily care of the mouth. He must be made to understand the reason for such care, if he is to realize its importance and necessity.

J. Edwin Waterbury, Hollywood, California: We go to conventions and hear good things and *don't* put them into practice.

It seems to me that three-quarters of the patients that come to my office have the *beginnings* of pyorrhea and I find that it is quite common among dentists to say in those cases: "You have no pyorrhea, only a little gingivitis" and so they neglect it until it really is pyorrhea in the later and more serious stages. It is very common among physicians to say that pyorrhea cannot be cured, and that it is better to have such teeth extracted. I think this is largely because our profession is so negligent about these beginnings. Dentist's should call the disease pyorrhea even in the beginning, give the patient fair warning and say, "while you haven't an advanced case

you have the beginnings of pyorrhea and you can look for the real thing unless your teeth are regularly gone over every six months or every year at least. Unless you do have them properly cleaned or attended to you will eventually lose your teeth." I believe one of the principle reasons the majority do not give this work proper attention is because they do not charge enough to warrant them doing it correctly. One dentist has a fixed fee for "cleaning teeth" because the fellow across the street also has a fixed fee for the same operation. The majority of people never clean their teeth properly, and they cannot do so with the present understanding of cleaning teeth. Brushes alone won't do it, although I do not agree with dentists who say "the toothbrush is no good." Floss is good. I am instructing my patients who have bad lesions and pockets, to take a wooden toothpick, twist a whisp of cotton on the end and with this I show them how to clean between their teeth, both front and back, or I recommend them to stand before a mirror and go around the pockets and necks of their teeth, using a pair of slender dental pliers, with cotton pellets.

Dr. Coolidge, (Closing): If this paper were intended only to interest those who devote all their time to the practice of periodontal membrane treatment or pyorrhea treatment, it would have been an entirely different paper. But the purpose of this paper was to appeal to those who practice general dentistry. Dr. Waterbury, brought out one thing I was glad to hear. He said we often go to meetings and listen, are inspired and then go away but don't carry our inspiration into practice. If we can just get something really practical out of every paper we listen to and apply it then we are going to be greatly benefited, and the one who reads the paper will be pleased if he can present it in such a way that something practical can be carried away and used. This paper does not deal with a specialty, it deals with daily problems and the little things that are entirely overlooked in most instances.

I would recommend that you go through your records of all the radiographic examinations of people's mouths that you have between the ages of fifteen and twenty-five and just notice how many of those cases show the absorption of the septal crest of the alveolar process. Every one of those areas where the crest of the alveolar process is absorbed is a very serious danger point to the life of the adjacent teeth.

I am called upon to make an examination of students' mouths. It is one of the rules of the Department of Therapeutics in the University of Illinois, College of Dentistry, that we examine the mouth of every student before he gradutes from the school and discuss with him any abnormal or pathologic condition that may be found in his mouth and the general condition of his oral hygiene. We send him away with a little advice, if he needs it, in regard to his own case, because our experience in examining the mouths of dentists has taught us that they are sadly neglected after they once get into practice. Some of the most unfortunate mouths I have ever had to work upon have been the mouths of dentists themselves. So in the examination of the mouths of the young men year after year for the last seven years I have been increasingly impressed with the importance of these little things that I have called to your attention.

The question was asked, what to do when that crest has been absorbed away. What I wish to do is to correct the cause of the trouble before there is anything further necessary in the way of treatment. The treatment of pus pockets is beyond the limit of this paper to discuss. Very often there should be some further treatment. Sometimes surgical treatment is necessary but such treatment is not indicated for gingivitis.

I want to thank Dr. Biddle for bringing out so forcibly as he did, the points that he emphasized and especially those in regard to the tooth form. Proper tooth form will prevent most of these conditions. We must have proper tooth form and clean teeth to preserve the health of the soft tissue.

ESTHETICS AS APPLIED TO FULL DENTURE PROSTHESIS

By JAMES H. HOWARD, D.D.S., Hollywood, California

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ESTHETICS is that branch of philosophy which deals with the beautiful. It is the science of deducing from nature and from taste the rules and principles of art (1). Science consists of organized truths or facts about any subject. Art consists in modification of things as found by man to make them answer the purpose in hand. Prosthesis is the art of adding artificial parts to supply defects of the body. Denture prosthesis is the science and art of replacing lost dental organs. The term will be used in this paper in the sense of full dentures.

Esthetics in denture prosthesis is both a science and an art. A science, because governed by certain established rules. We are enabled in the light of modern science to make our tooth selections in shape, size, color and arrangement in the arches according to certain definite, scientific rules, such as the following (2). The outline form of the upper incisor, when inverted, should approximate the outline of the face, the other teeth harmonizing with the centrals. The size of the teeth should be in proportion to the size of the mouth; the width of the six upper anteriors and the width of a small mouth being about equal. Medium and large size mouths are from three-eighths to five-eighths of an inch wider than the six anteriors. The length of the teeth is in the same proportion to the width, as the length of the face is in proportion to its width. According to established rules in color selection, for edentulous patients, teeth should harmonize with the color of the skin around the orifice of the mouth. Light-skinned people require less depth of color in the teeth than persons with complexions modified by a great deal of red or yellow, or darkened by exposure to the sun. Faces with clear or brilliant red coloring require teeth of clear yellow, while faces having bilious, muddy yellow skins require teeth of a yellow muddy hue. In arranging the teeth we are told to set the upper central so that its long axis is vertical when seen from the front and inclined downward and forward when seen from the side. Its incisal edge should be in contact with the occlusal plane. The lateral is set so that the incisal edge is about three-fourths of a millimeter above the level of the occlusal plane, and the long axis is inclined downward and forward, having the neck less prominent than that of the central. The tip of the cuspid should just touch the occlusal plane, and its long axis when seen from the front has a downward and forward inclination slightly less than that of the lateral, and when viewed from the side it very closely approximates the perpendicular. And so on, each tooth has its rule for arrangement.

The other phase of esthetics which we term art is that which is done by human hands. In denture prosthesis the operator must be able to bring into

play all the various scientific rules, including those enumerated above, and add to them his own artistic skill, and upon the degree of perfection attained in these two phases of work will depend the success of our efforts. Little changes must be made in the shape of certain teeth, even though they are the correct type, to lend character and individuality. The incisal edges are ground to typify excessive wear, the necks are ground so they will appear eroded, or abraded with the toothbrush. The natural teeth often vary in size. A lateral on one side may be small and peg shaped, while on the other, nearly normal. It is characteristic of some people to have large centrals and small laterals. Established rules for such cases are impossible. An esthetic effect is dependent upon the artistic ability of the operator. Color presents many difficult problems if rules alone are adhered to. The brunette does not always have the dark or deeply colored teeth, neither does the blond always have light ones. In the same mouth the variation in depth of color is often very marked, and it would be impossible to have rules to cover all such cases. There are so many deviations, in the natural arrangement from the established rules that it is unusual to see teeth that even approximate the ideal. To obtain the best esthetic effect we must know the ideal and be able to artistically approach or deviate from it according to the requirements of the case.

Artistic ability seems to be a natural inclination for some people, but by the average person it is attained only by oft-repeated procedure. There should be no misunderstanding of the meaning of esthetics, but there seems to be a great variation in the interpretation of the meaning.

All will agree that beauty, harmony, and natural appearance are fundamental esthetic requirements, but different people have different ideas as to what constitutes beauty and harmony in nature. Many dentists in selecting porcelain teeth almost invaribly pick the largest size the case will permit, while others select the smaller moulds. Dealers in porcelain teeth say that most dentists have a few pet moulds and hues that they ordinarily use, and very seldom deviate in their selection. This is not because their patients are all of a few types, nor is it wholly due to a lack of appreciation of the significance of art and esthetics.

It is no doubt partly the result of habit, and in a large majority of cases due to pure carelessness, where speed and slip-shod methods are developed at the expense of quality, resulting in the unnatural artificial looking dentures we are so accustomed to seeing.

Many, however, are really conscientious in their efforts to interpret the rules and principles of esthetics, but rely too much on their own artistic ability and on somebody else's rules and principles, instead of seeking the real meaning of esthetics, which is to be found only by a study of the simple teachings of nature, the one great authority on this subject.

The remark is often made that nature makes mistakes, when as a matter of fact, nature is perfection. If the human embryo were always surrounded by natural environment, and this condition remained throughout the development of the body, perfection would be the result. All imperfections, therefore, are due to abnormality or pathology on the part of the individual or its ancestry. Many such imperfections appear early in the life of the individual and grow and develop with that person until they become a part of that life and character. Small imperfections in time become so closely interwoven with the personality that they are lost sight of as such and become a real asset in the life of the individual. To restore imperfections of this character when making artificial dentures requires additional study of the case and a greater degree of skill per-

haps than the establishing of normal conditions based upon prosthetic science. If more of these little inaccuracies were incorporated in the artificial teeth it would greatly improve their appearance by making them less conspicuous.

In order to get an idea of what has been done in esthetics in the past it will be necessary to give a brief history of prosthetic dentistry, because early prosthetics were devoted almost exclusively to the construction of appliances to restore lost teeth for appearance (3). Basing their knowledge on deductions made from the study of specimens found from time to time, scientists tell us that there are indications that prosthetic dentistry was practiced by the Phoenicians and Egyptians as far back as 1500 years or more, B. C. The Etruscans, a people who inhabited Upper Central Italy from about 800 B. C. may have gained their knowledge from the Phoenicians and Egyptians, but the specimens of dental appliances show a much higher degree of perfection. These specimens consist chiefly of two or more human teeth held together with gold wires or gold bands and rivets.

From about the beginning of the Christian era there may be found historical references to the manufacture of prosthetic appliances, and it is evident that movable artificial sets were made. The ancient Hebrew rabbis were said to allow their people to wear their silver false teeth on the Sabbath, since they appeared natural, but prohibited the wearing of their gold ones. At this time teeth were made of wood, bone, ivory and other substitutes.

Passing on down through the middle ages little progress was made in prosthetic dentistry.

The first reference to full denture construction was about 1650 when Anton Nuck, a Dutch surgeon gave his method of constructing a full lower denture from a single piece of ivory or tusk of hippopotamus, preferring the latter because of its whiteness and ability to preserve its color for seventy years. Full upper dentures were not made until a number of years after full lowers, because of the difficulty of retention; suction plates at this time, being unheard of. The first full dentures seldom contained more than the anterior teeth and were held in place by springs.

Effort was put forth in 1690 to produce a substance that would make a better appearance and be more durable. In 1728 the use of porcelain was suggested for teeth and dentures but nothing was done, until many years later, to develop this most important esthetic phase of prosthetic dentistry. Enamels probably in the form of paint, were being used at this time to give the gum portion of the denture a more natural appearance.

It was not until about 1774 that we have any records of actual experiments in porcelain, which resulted a few years later, after many failures, in the construction of a practical full porcelain denture. Many difficulties were encountered however, and it was many years before porcelain was used to any appreciable extent.

To an Italian dentist by the name of Fonzi, practicing in Paris in 1808, is given the credit of introducing single teeth and blocks of teeth. After the introduction of porcelain teeth more gold, silver and platinum plates were made, but on account of the limited production of the new teeth, and imperfect technical methods, dentures were carved from bone, ivory and other substitutes for many years.

In 1817 porcelain teeth were introduced into America by A. A. Plantou of Paris, who began to manufacture them about three years later; but it was not until about 1825 when S. W. Stockton started to manufacture porcelain teeth that they began to be more extensively used.

About twenty years later Samuel S.

White of Philadelphia entered the manufacturing field by offering the dentists teeth and other supplies of a very high character.

Up to this time the construction of prosthetic appliances was chiefly for appearance. Later, when metal dies and plaster models came into more general use, dentures were constructed that would fit well enough to be used for masticating purposes.

It will therefore be seen that esthetics, in prosthetic dentistry, preceded the art of restoring the function of mastication by over three thousand years; or it may be said that esthetics has been practiced thirty times as long as prosthetic utility. Here, it might be asked, have dentists profited by the long experience of their predecessors? Is esthetics, as practiced today, keeping ahead of or even keeping up, with other phases of prosthetics?

The advent of porcelain proved to be quite a stimulus to prosthodontia. Many and varied were the bases and appliances constructed to support the teeth. Gold, silver and platinum were used as bases with the teeth riveted or soldered on. Then came the cheoplastic or cast bases made by pouring molten metal around the teeth which were set in moulds. Next came the vulcanite base and a little later the celluloid.

For the next fifty years the advancement in esthetics was very slow. It is true that individuals did some creditable work but the profession in general stuck to the old porcelain teeth, some of which were made in the original moulds of the manufacturer, being poorly formed and unnatural in color, and while they might have been considered very good for a beginning, were by no means a perfectly finished product.

The introduction of teeth, according to specifications worked out by J. Leon Williams, has proved to be one of the greatest steps forward in esthetics within the present century. These teeth are by no means perfect reproductions of all natural dentures, but they are so far ahead of anything that has been produced in the past that there is no comparison; and with a little artistic ingenuity, the dentist is able to produce results of an exceedingly high character.

So many and varied are the requirements in esthetics that it would be impossible for a manufacturer to produce teeth that would fill every need. The prosthetist must select the nearest available likeness, then make the necessary changes to suit the requirements of the case at hand.

There has been a great deal written within recent years on esthetics, and the subject has been very thoroughly covered. Many leading men of the profession have given much time and thought in an effort to place this very important phase of prosthesis on a higher plane. To these individuals a great deal of credit is due.

Unfortunately, however, the practical application of the principles of esthetics seems to be limited to a comparatively small number of dentists, while antiquated methods are still being adhered to by a large majority. When we consider how long this art has been practiced, it doesn't seem possible that this statement could be correct, but to prove it conclusively one has only to observe the dentures being worn by the rank and file of the denture-wearing public.

There are wonderful strides being made in nearly all other branches of dentistry and other phases of prosthesis are making great progress. Esthetics is a subject of vital importance and there is no reason why it should not receive an equal amount of consideration.

There is no subject of equal significance in dentistry at the present time which offers such a vast opportunity for improvement, coupled with such a large amount of available information, and the certainty of appreciation and reward for success.

A study of nature is the real secret of success in esthetics. A careful study of the teeth before extraction should not be neglected. Little peculiarities of arrangement, when artistically carried out in the artificial substitute, lend materially to the naturalness of the case. Nature's scheme of arrangement offers many valuable suggestions that are worthy of consideration. Form and hue can rarely be improved upon and are seldom equaled in the artificial.

A study of the face gives us the necessary data for restoring its contour, fullness and length. Those who follow nature's plan in reproducing the teeth are always amply repaid. The gratitude of a pleased patient is the greatest compensation possible. Let us hope that more effort and greater enthusiasm will be expended in developing this very important phase of dentistry.

Progressive prosthetists have long recognized the importance of procuring nature's most valuable data from the natural teeth for future restoration. Even though but one lone anterior tooth remains in the arch, there is a fund of information in that homely looking tooth that cannot be gained from any other source. You may measure the head and the face, or use any other method or scheme you choose, to determine the form and size of a tooth, but you will rarely ever select one that is as harmonious in that particular mouth as a duplicate of the one that came out of it. You may be an expert in color selection, but if you can select teeth with color and hue that blend as well with the surrounding features as do teeth with color scheme, suggested by this lone remaining natural tooth, you are either a good guesser or a genius and should not be classed with the average dentist.

When the edentulous patient presents himself we are compelled to use a certain amount of ingenuity, together with our knowledge of certain general rules and principles in esthetics, and a generous supply of personal judgment. In other words we have to do the best we can. But why should such a condition exist? Why should we have edentulous patients present themselves without any knowledge or record of the form, size, hue or arrangement of their natural teeth or contour of their face? It is because you or I failed to do our duty to this patient before she lost all her natural teeth. It is because of a custom, which extends back as far as the history of prosthesis and is the curse of dentistry today. I refer to the haphazard extraction of teeth without first obtaining nature's most valuable data for future restoration.

I sincerely hope, and believe the time will come, when it will be the universal procedure for the dentist to make necessary records before the teeth are lost, these records to be filed away or given to the patient for future reference. This requires but little time and is of inestimable value to both the patient and the operator.

The teeth should be carefully studied and records made as to arrangement, hue and form. Take impressions of upper and lower teeth and a wax bite. Do this in all cases regardless of the number of remaining teeth.

Carefully note the contour of the face and lips and make an accurate record of the profile. A very good way to do this is to vaseline a strip a quarter of an inch wide along the median line of the face, from the forehead to well under the chin, and lay a narrow strip of tissue paper along this line, pressing well to place at all points. Then saturate a piece of ordinary soft cotton-wrapping twine with impression plaster of paris and lay along full length of tissue paper. Now lay a wire, (No. 12 or No. 16 gauge) which has been bent to roughly approximate the profile, on top of the string and with a small spatula fill in with soft plaster between string and wire. The string reinforces the plaster in direct contact with the face while the

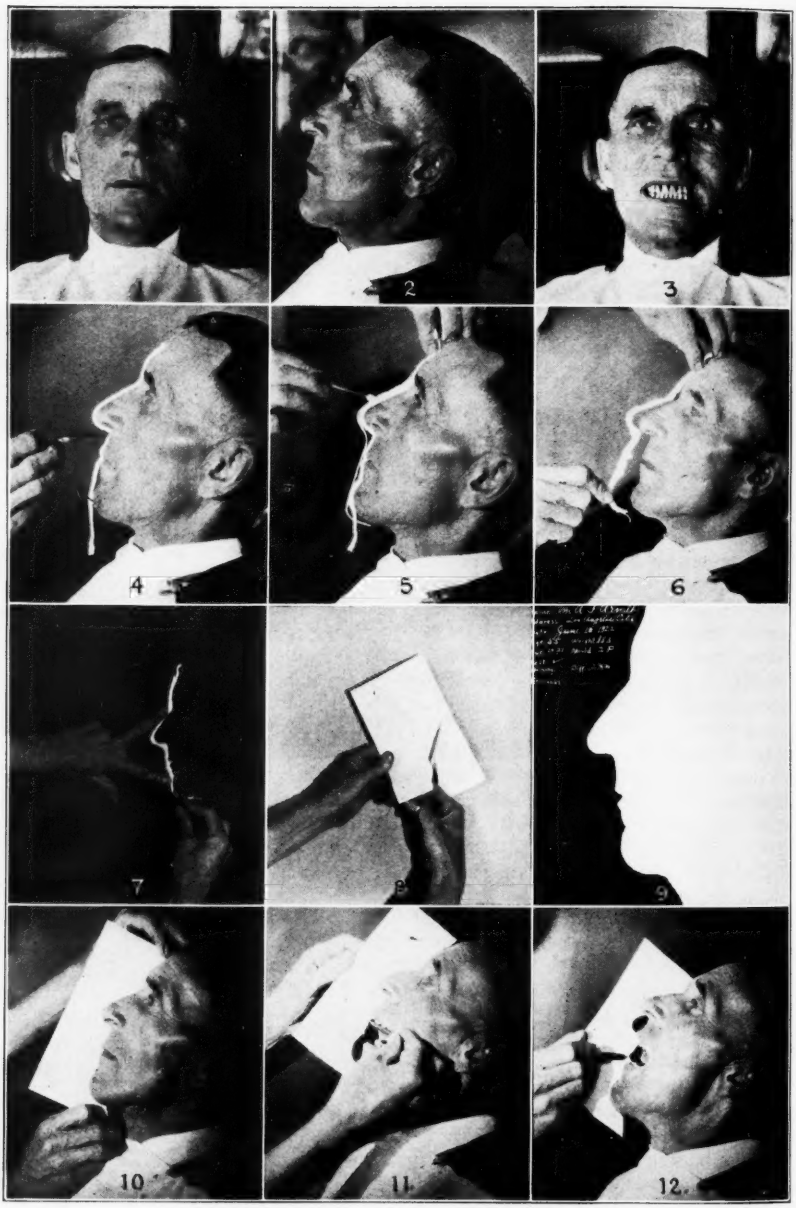

Fig. I.—1, Front view of patient before teeth are extracted. 2, Profile view before teeth are extracted. 3, Showing the natural teeth before extraction. 4, Starting to make the profile cast by laying a string which has been saturated with plaster of paris, along the median line of the face. 5, Re-inforcing the string with a wire which has previously been bent to approximate the profile. 6, Removing the profile cast from the face. 7, Tracing the outline of the plaster cast on cardboard. 8, Cutting out with scissors. 9, The cardboard profile record. 10, Trying the cardboard profile record on the face to see that it is correct. 11, Marking the length of the upper teeth. 12, Marking the length of the lower teeth.

wire acts as a stiffener. Let it set, then carefully remove. Lay aside a few minutes until thoroughly hardened, then, with a sharp knife, trim sides away until the facial aspect of the case is quite narrow. The cast should then be laid on a piece of cardboard and outlined, then cut out with scissors. Try the cardboard on the face to see that it is correct and mark the length of the teeth upon it. To mark the length of the upper teeth, hold the card in place on the patient's face and raise the lip, exposing the incisal edges of the centrals. Mark length on card. Now have the patient open the mouth and holding the card in position on the lower jaw, retract the lip and mark the length of the lower teeth.

If but one cast is made it should be of the rest position of the jaws, then have the difference between the rest and occluded position accurately recorded in millimeters and filed away with other data.

Records may be made in a similar manner of other parts of the face and lips. This is especially desirable in the region over the cuspid eminences.

Every dentist knows how difficult it is to restore this region to proper fullness and contour. To accomplish this it is first necessary to know what the contour was before the teeth were lost. This may be recorded by making a horizontal cast along the lip just below the nose and extending onto the cheeks. A cast, extending from one cheek to the other along a horizontal line at the junction of the lower lip and chin, is also helpful.

The cardboard records may then be filed away for future reference, being easier to file and less liable to be broken than the plaster casts.

Another method of recording the profile is to place the patient in front of a window and take a snapshot, with a camera. If a small camera is used, measurements must be taken of the face in order to tell what size to make the enlargement. A simpler way is to use a camera large enough to take actual size. Make a print on heavy paper and cut out as previously described. Any other method may be used if it is accurate, recording definitely all sharp turns and angles, and if it does not make pressure enough to displace soft parts, such as lips and underneath the chin.

After experimenting with many different methods, I find that, in my own hands, the plaster of paris technic is the most practical, because it is accurate, comprehensive, simple and quick.

We now have recorded and filed away for future reference, the hue of the patient's teeth; we have the patient's extracted teeth on an articulator which gives us the form, arrangement, and many other valuable details; with the aid of the profile and lip records we have the length of the upper and lower incision, the length of the bite, the fullness and contour of the lips.

In setting up the teeth the bicuspids and molars should anatomically articulate for efficiency's sake, but with the incisors and cuspids, efficiency must often be sacrificed for esthetics. In the majority of cases it is possible to reproduce the general characteristics of the natural arrangement without materially affecting the anatomical arrangement of the case. A compromise is sometimes better than extremes in either direction.

Staining the artificial teeth to reproduce characteristic discolorations, enamel cracks, porcelain fillings and unusual hues should be more generally practiced. In rare cases gold fillings add materially to the natural appearance.

It is not possible or even advisable in all cases to try to absolutely reproduce the natural teeth but in most cases if the scheme suggested by nature is intelligently followed, the results will be extremely gratifying.

More study and greater enthusiasm in esthetics will be the means of placing

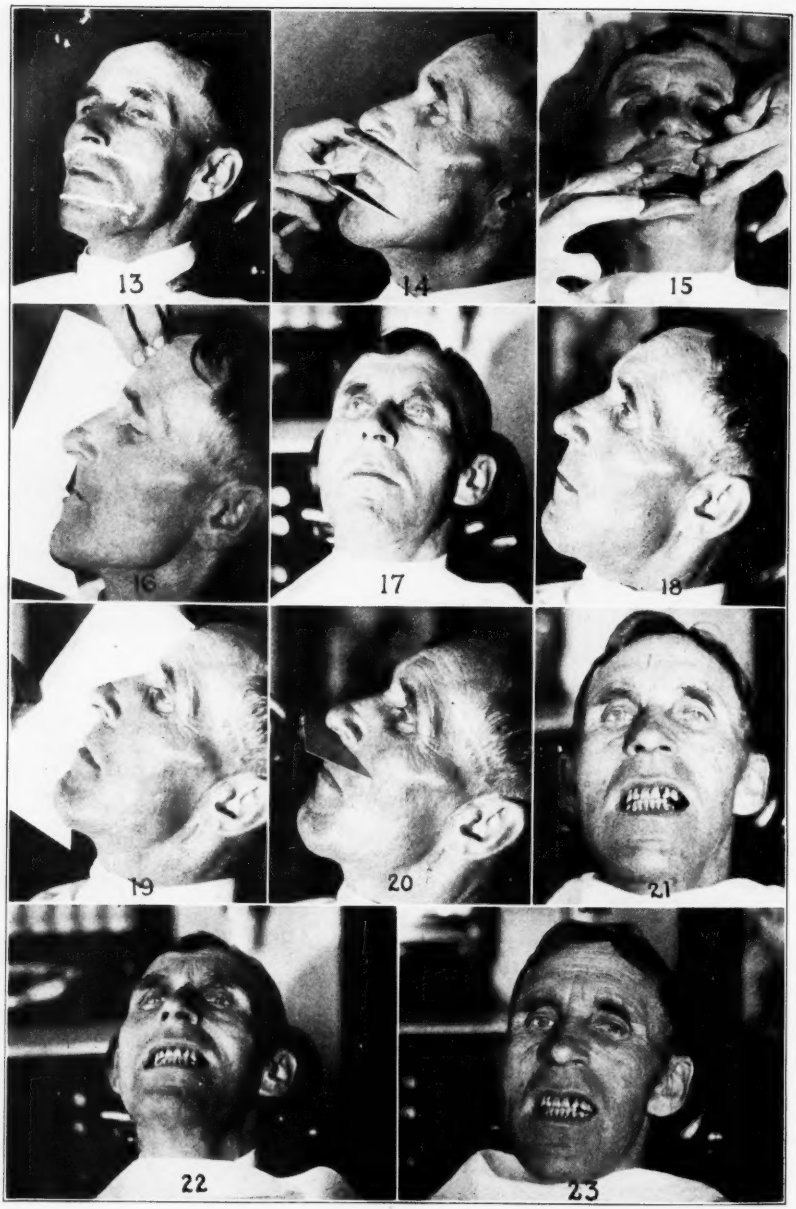

Fig. II.—13, Making horizontal casts of the face. 14, Testing the horizontal cardboard records for correctness. 15, Showing that the teeth have been extracted. 16, The profile record in place after extraction showing change which has taken place. 17, Front view with the artificial teeth in the mouth. 18, Profile view with the artificial teeth in place. 19, Profile guage on the face after insertion of artificial dentures. 20, Testing for fullness in the cuspid region. 21, Showing artificial dentures with left bicuspids and molars blocked out. 22, Showing artificial dentures with left bicuspids and molars blocked out. 23, The artificial reproduction.

denture service on a higher plane. When we learn to produce dentures that look more like real teeth and less like a row of piano keys, we will render a service to humanity, the importance of which is not appreciated by anyone except the person who is confronted with the necessity of seeking such service. Few of us realize what it often means to a person of sensitive nature to be compelled to wear teeth that are inharmonious and unnatural in appearance. The depression of the mind in such cases may easily be the predisposing cause of ill health. Too many artificial dentures are constant reminders of the graveyard. Gloom is opposed to good health. We can no doubt add ten years to some of our patients' lives by making them happy with their appearance and I am sure we can add at least ten years of happiness to the lives of many others.

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Discussion

V. Clyde Smedley, Denver, Colorado: Dr. Howard's paper is one of the best presentations I have ever heard on this subject and I can do no more than simply emphasize some of the points brought out by him and perhaps add a couple of additional thoughts of my own. His replacement in the case shown is to me a beautiful work of art. True art is the art that conceals itself.

The denture prosthetist is confronted with two distinct phases of art—imitative art and creative art. Dr. Howard's case is one of imitative art; I would like to call the case I will show alterative or corrective, for in this case it was not desirable to reproduce accurate conditions as presented and recorded.

I think it should be considered inexcusable negligence, if not actually malpractice, for any dentist to extract teeth for a patient without either making proper records of the case or being assured that such records have been made by the method described by Dr. Howard or by some one of the many other methods that are accurate and satisfactory.

For the sake of better denture esthetics, I would recommend an entire new and different system of producing and supplying teeth. As it is now, all porcelain teeth are made from models that have been hand-carved by some individual, and they more or less accurately simulate natural teeth in appearance, but none of them accurately do so, and they never will be as accurate as they should be as long as they are carved by the hand of man. Tooth molds should be made from models of natural teeth. This fact seems to me so simple and obvious that it is astonishing that it has not been done before. To be sure the molds would have to be enlarged the exact amount that porcelain shrinks, but surely this can be done mechanically and accurately.

Photographs and casts should be made of the faces and teeth of a large number of people with pleasing looking and satisfactorily functioning natural teeth. These should be divided into three groups with five or six in a group, selected to typify or represent a large class or division, in any one of whose mouth a single set of teeth selected from the group could be placed (with suitable variance as to size, hue and arrangement) to give a pleasing appearance and provide for satisfactory functioning. If this were done I think we would be surprised to learn how few different molds and shades are really necessary for the most pleasing and satisfactory results. Mold guides should be provided with photographs of these groups of typical faces accompanying each mold of teeth. It is my opinion that three molds, each provided in three or four sizes, would give us all the teeth required for our work. Let me emphasize that these molds should be exact reproductions of natural teeth with photographs of the original subject accompanying same.

I now want to make a plea for the continuous gum denture the most beautiful, the most comfortable, the most idealistic artificial denture for the human mouth (where it is indicated). The principles of the continuous gum denture were first conceived and developed to some extent by M. Delabarre of Paris in 1820. It was later developed almost to its present stage of perfection and demonstrated to the profession by John Allen of Cincinnati, later of New York, about 1844. This form of denture for a long period of years practically dropped out of service, but thanks to the general awakening in prosthesis, it is coming back and our chief concern now is a matter of technic, in which there is room and call for much thought and great development on the part of most of us at least.

Instead of using the regular continuous gum teeth with the long flexible platinum pins,

I eliminate the pin altogether. The bite is taken and anterior pinless crowns and posterior diatoric teeth are set in wax upon the platinum base to desired position for articulation and esthetics. Now the lower cast is removed with its bow from the articulator and replaced with another bow. Place upon this bow some soft plaster and close the articulator to its former position with the occlusal surfaces of the teeth imbedded in the plaster where it is allowed to harden, forming a matrix. When plaster is hard the wax is removed from the case and the teeth are baked separately down to crown form longer than required to make contact with the platinum base when set in their proper places in the matrix. They are now ground to fit the platinum base very accurately waxed on the labial and removed from the matrix in their correct positions to the platinum base with wax on the labial and buccal surfaces only. Now paint the teeth with shellac and allow to harden, then mix a thick putty-like mix of alundum cement, form a roll of it about one-quarter inch thick and lay it around the occlusal and incisal surfaces, allowing it to extend down upon the teeth sufficiently to engage them as in a matrix. Extend a similar roll across the palate from first molar to first molar, supported with a pillar of the same material in the middle of the palate. This is allowed to dry several hours, when the wax is removed and the whole case is brought to a red heat in a drying out or electric furnace. When cool, S. S. White inlay porcelain is worked under and around the teeth and the first baking of foundation body is applied, building the palatal and labial contour as far as may be with proper distribution of bulk with scoring for control of shrinkage. The case is now baked with alundum splint in place. When the foundation body has been brought to a low biscuit bake, the case is allowed to cool and a second application of body is applied with carving for correct palatal and lingual contour. It is again placed in the oven and fused, using great care always not to overfuse the porcelain. When cool, the case should now be ready for a coat of pink gum enamel which should complete the case when baked. The gum is made lighter or darker pink to match the natural gums by placing this coat of enamel on thinner or thicker as the case requires.

G. A. Swendiman, Grand Forks, North Dakota: Of first importance to the prosthetist is that he must have intimate knowledge of the different classifications of profile. Next, he must have a clear understanding of the muscles of expression and the function and action of each. Third, he must make an extensive study of the lips and be able to place them in their proper class. Fourth, he must be familiar with the different types of faces. Fifth, he must have a clear understanding of the class of arches and alignment and the resulting blends. Sixth, he must know the laws of harmony. When the prosthetist has a clear understanding of the muscles of expression and knows the function and action of each, it enables him to properly set up the teeth and to contour the contiguous gum restoration so that the normal muscle tone and proper muscle tension can be restored.

If the face were always in repose the study of esthetics would be finished, but the severest test of esthetic creation is when the patient is speaking and laughing; for then, the size, form, color, arrangement individualized effect of the teeth are on exhibition.

The proper contour of the lips is the keystone to the highest esthetic effect, and unless the lips are given the necessary attention, the expression and character that properly constructed dentures give to the face, and which is so necessary to success, will be lost.

A cheery and pleasing expression can be obtained by proper contouring of the lips, and which can only be done by the proper setting of the anterior teeth, and the correct relationship of the mandible to the maxilla.

Dr. Howard (Closing): I realize that it is very difficult to absolutely reproduce a natural tooth in porcelain, because of the uneven shrinkage of porcelain, but I believe it can be done.

I want to again emphasize one point and that is that I do not advocate the absolute reproduction of all natural dentures. I have shown a reproduction of decayed spots and fillings not because I believe they should always be brought out but I want to lay stress on the possibilities of reproduction work. There are many conditions brought about by pathology, that are not natural, consequently should not be reproduced. An important point to remember is to always make records before the natural teeth are extracted, then you have a cue to go by, even though, as I have said, only one tooth remains, you get an idea as to form, hue, length of bite, arrangement in the arch and other valuable hints even though you do not care to follow them all absolutely.

RULES FOR THE PREVENTION OF PERIODONTAL DISEASE

By RUSSELL W. BUNTING, D.D.Sc., Ann Arbor, Michigan

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

ANY consideration of disease prevention may be based only on the primary causes of the disease in question and the means by which these causes or their specific effects may be aborted. In the case of pyorrhea the causes are not definitely determined, that is, there is at the present time considerable variance of opinion regarding the exact nature and origin of the disease. During the past fifty years, careful study has been directed toward the solution of the problem through experimental and laboratory methods as well as clinical observation, as a result of which the students of the subject have been divided into two general groups, the localists and the constitutionalists. The former group consider pyorrhea to be a purely local disease arising from local causes while the second group believe that it is but a local expression of a general or systemic disturbance.

The literature of our profession has been replete with contributions to both views of the question. The localists on the one hand have described pyorrhea as arising from the trauma of calculi, overhanging fillings and crowns, the impact of foods in mastication, or traumatic occlusion, and from specific infections such as amoebae, streptococci, spirochete, and other microorganisms. They point out the frequency with which these local injuries are associated with the lesions and disturbances of the disease as evidence that these are the active causative factors.

In reply to these statements the constitutionalists call attention to the fact that many mouths are subjected to severe traumatic strain, either calcular, operative or occlusal, but show no evidence of pyorrhea. It has repeatedly been shown that amoebae, spirochete, and all organisms commonly found in pyorrheal lesions exist as well in healthy mouths, and that the inoculation of a healthy mouth with these organisms will not produce the disease. They claim that pyorrhea arises from underlying constitutional disturbances, that the initial lesion is a progressive degeneration of the alveolar bone, and that local irritations have little or no part in the process. In substantiation of this view, it is pointed out that pyorrhea is frequently associated with gout, arthritis, and various nutritional and systemic disorders. In this connection the recent work on diet and nutrition, in which pyorrhea-like lesions are produced in animals by various deficiency diets, is of special significance. In rebuttal the localists claim that the disease is amenable to local treatment, that it may be cured by local prophylactic measures alone and therefore that it is a local disease.

It is apparent that neither of these strictly partisan views has received universal approval nor will either of them satisfactorily explain many phases of the disease. There are many who believe that there is no one specific cause of pyorrhea which is uniformly present in all cases but rather that the disease is a

symptom complex in which a variety of causes both local and constitutional are concerned. This concept is well stated by Maurice Roys[1] in a review which he gave before the Sixth International Dental Congress in London. He places the greatest emphasis on an initial bone degeneration due to what he terms "precocious senile degeneration." He believes that local trauma and infection enter into the process of periodontal destruction but considers them to be adjuvant causes and secondary to degenerations in the alveolar bone which are general and systemic in origin. He asserts that local irritation, such as mechanical stress infection, and faulty oral hygiene, when acting alone, produces gingivitis but not pyorrhea unless there is also present a degeneration of alveolar process. On the other hand, he believes that osseous degeneration of the alveolar process without local irritations produces only simple atrophy of the periodontal tissues and does not give rise to the typical lesions of pyorrhea.

These views of Roys' are corroborated by many other students of the subject who, although they state the proposition in somewhat different terms, agree on the basic principles: namely, that pyorrhea is produced by the combined action of local irritation acting in conjunction with systemic fault. With this concept in mind, as we consider the great variety of systemic derangements which may influence the alveolar structures and the different forms of local irritation and infectious processes which are associated with the various cases, we may then appreciate that pyorrhea is not a uniform or specific affection. On the contrary, it is evidently a complex disease process having many forms and variations determined by the various local and general factors involved and the character of the tissues which are affected.

[1]Pathogenesis and Prophylaxis of Pyorrhea Alveolaris. *Dental Cosmos*, August, 1918.

When in the consideration of a disease process we become confused with the multiplicity of conflicting theories, it is wise to review again and again all the facts concerning the disturbance which have been so well established that they are beyond the realm of theory and speculation. In the case of the disease in question there are certain features of the process which by clinical experience and common observation have become established as facts.

In the first place, it is generally recognized that pyorrhea is a disease of civilization. That is, the primitive and native races rarely suffer from periodontal disease to the extent that is seen among civilized people except under special conditions, such as the chewing of betelnut and leaves sprinkled with lime. Those who follow this practice have large accumulations of calculus about the teeth producing extreme periodontal inflammation and wholesale loss of teeth from pyorrhea-like lesions in races which are otherwise immune to the disease. Among civilized peoples there are numberless ways in which the periodontal tissues are made more susceptible to disease. The evolutionary trend by which the maxillary processes uniformly are becoming more slender coupled with the universal adoption of soft foods which do not require vigorous mastication, have produced weak and poorly formed alveolar processes in which degenerative changes are easily incited by any injury. Consequently civilized races are naturally more susceptible to periodontal disease and unless protective measures are employed to counteract this tendency, pyorrhea ensues in a large percentage of cases.

It is further noted that periodontal diseases are related to the age of the individual. Typical pyorrhea seldom occurs in childhood and rarely before maturity after which time the rate of its incidence increases with age. It would seem that during the building years in which ana-

bolism is high the periodontal tissues successfully maintain their integrity, but after the plateau of life has been reached and on the downward slope of advanced age alveolar degenerations are so common that they may almost be considered normal to the age. So also during these years there is increased tendency to calculus formation which if allowed to remain may furnish the necessary local irritant to disturb the periodontal tissues.

Seldom do we find pyorrhea and dental caries actively progressing in the same mouth. It is true that they belong to different ages, caries being prevalent in youth and pyorrhea later in life, but the fact that, as a rule, in adult life when caries is prevalent there is no pyorrhea and conversely when pyorrhea is active there is little dental caries is a very significant observation. The behavior of these diseases suggests the possibility of specific flora in each case, that is in one a predominance of acid forming organisms with the production of caries, and in the other proteolytic types of bacteria giving rise to periodontal lesions and pyorrhea.

In a large percentage of cases some form of local irritation either traumatic or infective may be found associated with the periodontal lesions. For instance, when the disturbances are limited to the tissues about a few teeth it will usually be found that there is just at that point some accumulation of calculus, an overhanging filling, an open approximal contact or excessive occlusal traumatism. The remarkable coincidence of these irritations with the location of pyorrhetic lesions and the fact that following the removal of the irritating agencies the periodontal tissues usually show a marked improvement and a return to normalcy points in no uncertain manner to the fact that local irritations constitute active causative factors in the inception and progress of the disease.

An even more significant fact is the observation that local irritations do not affect all tissues alike. In one case a given local irritant will be followed by deep periodontal involvement and serious pyorrheal lesion, while in another mouth the same form of irritant may produce little or no disturbance or it may be followed by hypertrophic changes in the gingival tissues. The distinctive difference between these two types of cases is the character of local tissue resistance. Normally the periodontal tissues possess a high degree of resistance to traumatic stress and infective organisms but when the resistance of these tissues has been lowered by constitutional fault or by continuous or excessive local irritation, the infective organisms of the mouth may pass nature's first line of defense (the normal mucous membrane and gingival tissues) and invade the deeper structures producing in them typical lesions of pyorrhea. Especially is this true when the end circulation of the gingivae has been disturbed by circulating systemic poisons such as mercury or lead and by the products of intestinal intoxication or dietary fault. These produce passive congestion and lowered nutrition of the local tissues which result in a lowered tone and resistance of these tissues to specific types of infection.

From the foregoing facts it would appear that pyorrhea is favored by our present day mode of civilized life, by advanced age, by systemic intoxication, faulty diet and metabolism, and all conditions which lower tissue resistance, and by local irritations and infective processes in the oral cavity. It is toward these factors therefore that the prevention of periodontal diseases must be directed.

The preventive measures to be employed may be divided into the following three groups:

1. The elimination of systemic faults which lower local tissue resistance and produce degenerative changes in the alveolar process.

2. The removal of all undue stress,

traumatic or infective, from the periodontal tissues.

3. The stimulation of the gingival and periodontal circulation.

The first group of preventive measures should include all the principles of general health and hygiene for there are few general systemic or metabolic faults that are not reflected as disturbances of the gingival circulation or degenerative changes in the alveolar bone. Cases of marked predisposition to periodontal disease are frequently associated with malnutrition, scurvy, rachitis, gout, anemia, chronic constipation and other functional disorders. For instance, people who lead sedentary lives, who take little or no exercise and who eat heartily of high protein diets, invariably have gum tissues which are soft and flabby, chronically inflamed, and are prone to infection. In many such cases when the patient is encouraged to take the proper amount of exercise and to adopt a rational diet the gum tissues change their character, and become firm and highly resistant.

The recent work of McCollum and Grieves, who have succeeded in producing pyorrhea-like lesions in rats at will by feeding them diets which are deficient or unbalanced, is a most significant contribution to our knowledge of this subject. These results plainly demonstrate the fact that there is a relationship between the character of the diet and the health of the periodontal tissues. It is possible that when, as the result of further work on this problem, we shall know more of the science of diet and nutrition many of the obscure causes of pyorrhea may become apparent and capable of control.

There are many types of pyorrhea in which the constitutional factors are not easily discerned, or, if they are evident it may be impossible to correct them. Frequently mild insidious debilities exist which seriously affect the general and local tissue resistance but which even the most careful internist fails to discover. These may produce, among other disturbances, a marked tendency of the periodontal tissues toward pyorrheal affection. So also there are cases in which the constitutional fault is old age, chronic diabetes or nephritis, arthritis, gouty or tubercular diathesis, chronic constipation and intestinal intoxication, acidosis, obesity or other metabolic fault which is not amenable to cure. These disturbances may be subacute or chronic, not severe enough to incapacitate the patient but may produce a marked lowering of tissue resistance thereby acting as a constitutional cause of pyorrhea which cannot be eliminated. In all such cases the means of prevention are limited solely to the second and third groups. In fact, the practice of the first group of preventive measures, namely, systemic treatment, without the second and third groups is ineffectual for the prevention or control of pyorrhea except in most mild and incipient cases, for whenever the disease has become established, even though it primarily may have been of systemic origin, local irritants (calculus and infective organisms) have arisen which will keep up the local tissue disturbance and prevent healing unless they are removed.

If we admit that pyorrhea cannot occur without some form of local irritation acting in conjuction with a systemic fault, then we must grant that if the mouth is kept free from local irritants there will be no pyorrhea even though there be strong constitutional tendency toward the disease. It is apparent, however, that the complete elimination of all irritating factors from the mouth is impossible. The trauma of food and occlusal stresses are constant in all mouths and indeed they are necessary to the stimulation of a proper gingival circulation. So also oral bacterial flora are always present and cannot be permanently eradicated. The question of relief of local stresses and infective processes is therefore one of degree, and consists of the removal of

all undue irritation and the improvement of the circulation and tone of the gingival tissues to the point where they may successfully maintain their health and normality in the environment to which they are subjected.

The details of oral prophylactic procedures included in groups two and three are too well known to require restating in such a brief review of the problem. There are however, two very essential points to be observed in the prophylaxis of periodontal disease. First, to be effective, *oral prophylaxis must be thorough.* Indifferent or casual removal of local irritants, taking some and leaving others, is of little permanent value in the prevention of disease. Second, a *single removal of evident irritating factors will not suffice.* Every case should be given several consecutive sittings to determine whether or not the irritations have been reduced to the point of tolerance. It will frequently be found that although all calculi have been removed at a given time a fresh deposit may be discovered after a lapse of twenty-four to forty-eight hours. In many instances this seems to be the product of periodontal inflammation for if it be promptly and repeatedly removed until the inflammatory processes have disappeared and the gingival tissues have regained their normal tone this tendency to secondary calcular deposition diminishes to the point where it may be controlled by the patient. The thorough elimination of local traumatic and infective forces almost invariably results in an immediate improvement of local conditions and if followed up until the tissues have entirely regained their normal health and resistance the periodontal disturbances may be permanently controlled.

The third group of preventive measures, namely, the stimulation of the gingival and periodontal circulation, is very important. It is probable that the systemic factors involved in the production of periodontal disease act through a disturbance of the circulation and normal resistive powers of these tissues. It naturally follows therefore that the local stimulation of these tissues to greater circulatory efficiency will directly combat the systemic faults and will increase the nutrition, health, and resistance of the periodontal tissues, creating in them, as it were, artificial resistance and immunity toward disease. The operative procedures involved in removal of the calculi and other deposits in themselves improve the local circulation by stimulating the tissues and by the hemorrhage which usually follows. In this manner the congested and stagnant gingival circulation is revived and the vessels are washed by an influx of arterial blood. Following the operative procedures the proper use of a stiff toothbrush by the patient is an effective means of stimulating the gingival and periodontal circulation. To this end the gums should be brushed with a vigorous stroke toward the teeth so that the blood will be forced to and through the gingival capillaries. In this manner a pale and flabby gum tissue, after the removal of local irritants, may often be restored to its normal tone and resistance in spite of an existing systemic tendency to periodontal disturbance which may be beyond our ability to remove.

The efficiency of these principles to prevent periodontal disease has been clearly demonstrated by the clinical experience of hundreds of dental practitioners who have conscientiously carried out a regime of rational and thorough oral prophylaxis for their patients and who have succeeded in preventing or controlling the disease in the great majority of cases. Indeed the results will show that pyorrhea is the most definitely preventable disease which lies within the scope of dental practice. Further, that the prevention of pyorrhea may be accomplished by very simple measures of general hygiene coupled with oral prophylaxis and the continued maintenance

of a strict regime of oral hygiene by the patient. These consist of the maintenance of general health and the correction of outstanding dietary and metabolic faults, the removal of traumatic or infective irritants, the correction of occlusal stresses, and the vigorous brushing of the gums and teeth by the patient. By these simple measures alone even advanced cases of pyorrhea frequently may be checked and permanently controlled while the incipient cases may, with few exceptions, be completely aborted. In many cases it appears that the pyorrheal process began during a temporary bodily stress as in pregnancy or some systemic disturbance. When the patient recovered the periodontal infection which had been inaugurated did not cease with the general symptoms but continued to invade the deeper tissues being assisted by secondary deposition of calculi and tissue disturbances attendant upon the disease. In many such cases if these secondary traumatic and infective factors be removed and the local tissues be stimulated the disease may be checked and permanently arrested because the primary factors which produced the initial onset of the disturbance have disappeared. Cases of this type commonly occur in every-day practice and may be successfully treated by rational measures of prophylaxis if detected before the disease is too far advanced.

The use of drugs and vaccines for the prevention of pyorrhea has purposely been omitted from this discussion for the reason that I believe them to be unnecessary and of doubtful value. It is not possible at this time to state all the facts which lie behind this belief, save that oral and general prophylactic measures will accomplish the purpose in a great percentage of cases without the use of drugs or vaccines while the application of medicaments without thorough prophylactic measures is ineffective in the permanent control of periodontal disease. It is true that certain drugs are occasionally useful, such as astringents for hypertrophied gum tissues and the analin dyes for Vincent's angina and other forms of periodontal disease having a virulent or persistent type of infection but unless these are used solely as adjuvants to specific prophylactic measures directed toward the elimination of the underlying causes of the disease they are of little practical benefit. The continued use of drugs or medicaments in healthy mouths either in the form of mouth washes or as incorporated in dentifrices for the prevention of periodontal disease is, in my opinion wholly unwarranted.

It is of the highest importance that dental practitioners establish the invariable habit of examining the gum tissues of every patient in order that they may detect periodontal disease in its incipiency. Changes in color, form, or density of the gingival and surrounding gum tissues or the deepening of the gingival crevice should be a signal of danger to the practitioner which will cause him to seek the source of the local disturbance and correct it. In its incipient stages periodontal disease is most easily and effectually checked and if all practitioners gave the proper attention to discover the initial disturbances promptly and to institute proper prophylactic measures immediately there would be little pyorrhea among their patients.

THE OCCURRENCE AND PREVALENCE OF MOTTLED TOOTH ENAMEL

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(Read before the meeting of the West Texas Dental Society, Sweetwater, Texas, September 15-22, 1922)

THE disease now known as mottling or brown stain spotting or streaking of the enamel of the permanent teeth, is one which although apparently known for many years has only recently been described in dental literature.

This disease of the enamel is endemic in certain areas of Colorado and Arizona especially, and in small areas in the mountain regions of Texas, Virginia, South Dakota, California, Oregon, etc. It has been found in the Bahamas and Cape Verde Islands; and it, or a very similar disease, is reported as frequently seen in Holland. Under the name of "Chiaie Teeth," or "Denti Scritti," the condition of brown or black stained, or mottled enamel has been known in certain parts of Italy, although McKay is of the opinion that this is not identical, or at least has not been proved to be identical, with the endemic enamel disease observed in certain parts of the United States. A few cases were seen by Black in the United States outside of the endemic areas.

The question is one of paramount importance for the endemic areas concerned, as Black, McKay, and others, who have investigated it have found that a percentage as high as 87½ per cent of the native born children of these areas are effected. Only about one out of every ten children born in such areas escape it.

This disease has not been observed in the temporary teeth although Bempton, who in 1914 described two cases of brown pitmented and pitted enamel, dentin and cementum, says that it was seen in the deciduous and permanent dentitions. Bampton's case was hereditary, and it is doubtful if it is exactly the same pathological condition as I allude to here, and, which as far as known is not congenital.

G. V. Black, who began the investigation of this disease in 1908, states that the dark brown spots or streaks usually occur in pigmentation or mottling of the labial surface of the crowns of the incisors. He arrived at the conclusion that there was a failure normally occurring cementum between the enamel rods in the outer one-fourth to one-third of the surface of the enamel. Brown coloring matter takes the space of the normal cementing substance between the enamel rods; and the more of this brown stain that there is, the darker will be the color and the weaker the teeth. The outer-glazed enamel, i. e., Nasmyth's membrane, is however always normal. This same brown coloring matter, according to Black, appears regularly in about half the cases of dystrophias of the teeth, and

is probably the result of failure of proper development of the tissues.

The stains which show through the glazed enamel, may vary in shade from deep brown to opaque white. It is a great deformity, lasting for life, easily evident, and gives the individual an evil appearance. The stain appears only to be taken up by imperfect portions of the enamel, and during the growth of the enamel.

Dick thinks that the brown staining substance, to which Black gave the name "Brownin," is due to malnutrition. In the examination of 403 school children, Dick found that over 40 per cent of the poorly nourished, showed defects in the enamel. Dick observed the brown stains in the enamel, but seems rather to refer to the brown lines of Retzius which have been described in recent years by Asper.

The investigation of Black and McKay show that if a child is not in endemic area during the time of growth of the enamel of any group of the teeth (molars, incisors, cuspids, bicuspids, etc.), that group will not be marked; or, if there during the growth of one group, that group only will be marked.

This disease occurs without distinction among all inhabitants of the endemic regions, whites, Indians, negroes, and Mexicans. It is apparently quite independent of the occurrence of diseases of childhood, or of hygienic conditions, feed, etc. That the disease is contracted during the enamel-forming period is shown by the fact that children coming into these endemic areas after the age of 15 years do not at any subsequent time show the defects in the question.

Various theories have been put forward to explain the occurrence of mottled teeth enamel. Food has been alleged as a cause; and, as already stated, Dick considered that malnutrition was at least an important factor. Stasis and rupture of blood vessels and blood infiltrations into the forming enamel has also been assigned as a cause. The brown pigmentation was found by Black to be coincident in many cases with the occurrence of freckles. As already mentioned, Black considered the disease as a dystrophia. Grevers, of Utrecht, who has frequently seen similar lesions there, thinks that a thyroid disturbance, or at least some underlying defect in constitutional endocrine secretion, will be found to solve this etiological problem. In a general way the endemic areas of goitre and mottled teeth coincide, but usually mottled teeth patients do not show endocrine disturbance.

McKay, who has made the most thorough and extensive investigation of this disease visiting nearly all the endemic areas in the United States and elsewhere, came to the conclusion that the damage is wrought by some influence which acts either in an inhibitory or in a destructive way upon the enamel during or immediately after the building period, and that the condition is established prior to eruption.

For a long time in the endemic regions it was held as a belief that the disease was connected with the water supply. The question was thoroughly studied by McKay and it appeared from the investigations as if the disease was coincident with the use of artesian well water. In certain endemic areas it was found that children brought up on natural surface well water were immune from the disease, and those brought up on artesian well water were affected. But this feature was not found to be universal for endemic regions; neither could it be established that a low content of lime or iron or of any other of the usual mineral substances found in water could

be assigned as the cause. In some of the Bahama Islands, where mottled teeth were found, the people used shallow wells, the rain water passed through a lime formation and was highly mineralized.

In Italy, the "Denti Scritti" occur in regions where certain mineral and sulphurous springs are used. Two Italian authors, Piergili and Gasparrini, who have written on the occurrence of enamel disease (denti scritti) come to the conclusion that quantitative analysis had revealed a common characteristic in the waters of the regions where stained enamel is endemic, viz., that there is a minimum content of mineral salts in general, and of the salts of calcium in particular; and that this minimal content of calcium salts is the cause of the condition which produces mottled teeth. McKay however, points out that such a conclusion is not at all in accord with the actual facts generally observed in the United States.

Regarding the analysis of different waters from the endemic areas, McKay says that nothing definite can be proved from this. Specimens were taken from many different sources, and absolutely contradictory results were obtained. Thus the lime content was high in one locality and low in another, and yet the lesion was just as endemic in both places. The same was found to be the case regarding the acid content and the iron content. McKay believes that future analysis of water must be far more exhaustive than heretofore, all standard methods put aside, and search made for traces of the rarer elements overlooked in the past. Whatever the cause is, if it is in the water supply, which appears very probable, it has not yet been discovered.

Grever's opinion that mottled enamel is simply immature, not fully calcified, enamel depending on some endocrine irregularity, may be true, but it is not proved.

That the coloring substance "brownin" can find its way into the soft tissues and enamel in the course of formation was verified by Professor Gies and his co-adjutors in the Columbia University as mentioned by McKay. Gies injected a number of dogs with trypan blue intraperitoneally and found that fully formed teeth enamel resisted coloration, but the dogs showed deep pigmentation when they were in the enamel formative age. The trypan blue after its absorption by the blood was passed into and was permanently retained in a definite portion of the animal of each permanent tooth during the period of the enamel formation. Gies concluded that other coloring substances in the blood at such a period might have a similar effect on the teeth enamel. The tests and findings on dogs correspond exactly with the lesions as found in endemic regions and suggest the presence in water of some unknown substance capable of bringing about a condition which produces "brownin" in the system.

McKay, further discussing the results of water analysis, says that these results are inconclusive because either we are ignorant of the effect of certain chemical substances upon the process of enamel calcification, or else because the analysis was not sufficiently finely made to give the exact chemical nature of the water. The analysis of such waters must be made in laboratories equipped for the detection of the rarer elements which may only exist as traces.

The treatment for these conditions has been the removal of the affected crowns and the substitution of porcelain crowns; porcelain inlays, synthetic porcelain fillings and grinding out the discoloration

and polishing the enamel. The latter seems to be the best procedure in most cases in this endemic area.

Now that it has been proved that from 35 to 78½ per cent of the children born and raised in these endemic areas have this unsightly stain and mottled teeth, I think that we should ask through our state association for funds and men from the National Dental Research Commission to make a further investigation of this subject.

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ETIOLOGY, DIAGNOSIS AND TREATMENT OF PERIODONTAL LESIONS

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(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

Introduction

AMONG the many lesions to which the oral tissues are susceptible, there are none quite so common, or so little understood as those involving the investing tissues of the teeth. This group of diseases, now being recognized under the name of periodontoclasia but formerly known as pyorrhea alveolaris, was recognized by civilized people centuries before the Christian era (1). No doubt if its early history could be traced, it might extend as far back as the days of the Heidleburg man, whom we have reason to suspect from vague historical facts, had knowledge of the use of fire and changed the nature and chemistry of food through the custom of cooking.

In the centuries that have elapsed, the diet of man has been constantly undergoing changes, and as civilization has gradually advanced, the organs of mastication have proportionately deteriorated. Mental development of the human race has undoubtedly been accomplished largely at the expense of depleted physique and susceptibility to disease.

The deterioration of man is more pronounced in the mouth than any other part of the body. Very little, if any diseases or malformation of teeth and their supporting structures, can be found in the mouths of animals that live in their natural habitat, and select only such foods as are required for the maintenance of their bodies in normal health. The requirements of muscular energy in the function of mastication of modern food is inadequate for the proper development of the tissues composing the human oral organism; therefore, the teeth and jaws are not in a perfect state of development and are consequently more susceptible to the onslaughts of disease than other tissues of the body.

The health and development of structures in the animal mechanism is primarily dependent upon its use or exercise in normal function; for instance, any part of the body that is dormant for a sufficient period of time becomes atrophied and useless due to poor circulation. As a result of the constantly decreasing requirements of the teeth and jaws in the mastication of soft and cooked foods, there has been in each succeeding generation an increasing tendency towards the malarrangement of teeth with an ever increasing pathology of their investing tissues. As a logical consequence, it appears that the very nature of our mode of living has established a good foundation for the development of disease in the oral cavity.

Etiology

From some years of close observation, I firmly believe that Paul R. Stillman in his research work, has found the keynote in the etiology of periodontal lesions. Where there is a lack of harmony in the parts of a mechanical device, there is lost motion and excessive force brought to bear on that part of the machine which is out of co-ordination which consequently renders it less efficient in the performance of the work for which it was intended, as well as being the cause

of more rapid deterioration. Why should we not regard teeth in traumatic occlusion as an organ out of harmonious function and therefore susceptible to the same conditions as the machine operating inharmoniously? A stupendous percentage of teeth in mouths of civilized people are malposed and are therefore suffering from the injurious effect of traumatic occlusion. Consequently the careful diagnostician should be ever watchful for symptoms that indicate this condition. There are different groups of investigators who have expressed conflicting opinions concerning the etiology of periodontoclasia; one regards it as being due to bacterial invasion of the periodontal tissues; another believes it is entirely of constitutional origin; while there is still another group who believe it is a local disease caused chiefly by a disturbance of the circulation and slightly, if at all, influenced by general or systemic conditions. There is little or no evidence suggested to prove the constitutional theory. At least it is quite certain that the disease has never been successfully treated with a constitutional remedy. Pathological conditions of the periodontal tissues may be induced by the administration of too large quantities of certain drugs and scurvy is the result of an unbalanced diet. Both of these conditions are unusual, and while they resemble in many respects the type of periclasia so commonly observed, they are entirely different in their etiology.

There is unquestionably good foundation for the belief that nutrition is a potent factor in the etiology of periclasia and in the future much may be learned through the development of this line of investigation, but it is quite certain that so far nothing of value has been suggested in the nature of diet, except the research work of Percy R. Howe and this has only been applied in experimenting upon animals.

There is a difference of opinion concerning the germ theory, however it is quite evident that microorganisms are omnipresent in the oral cavity and must therefore be considered an etiologic factor. Infection may be, and probably is of secondary importance as they are always present even in a clean healthy mouth, but in greatly increased numbers in mouths where disease exists. There must be some disturbance in the blood supply which interferes with nutrition before there can be an invasion of the tissues by microorganisms.

Experiments have shown that the disease can not be introduced into healthy gingival tissue by inoculation; therefore it is not a contagious disease but when the resistive forces in the blood supply have been disturbed and there is present congestion and inflammation due to irritating causes such as traumatic occlusion, ill-fitting crowns, poorly finished fillings, or improperly adjusted dentures, etc., it is reasonable to assume that microorganisms always present in the oral cavity could easily invade such areas just as they do in exterior surfaces which have suffered traumatic injury.

Diagnosis

The intelligent and successful practitioner never outlines his plans of procedure in the treatment of a case until he has made a careful diagnosis, as the success or failure in results are largely dependent upon diagnosis. It is therefore essential that the diagnostician should know at a glance the difference in appearance of gingival tissues in the normal state of health and those which have become involved in the process of disease, even in the slightest degree, so that he may by contrasting the normal with abnormal be capable of recognizing the early warnings of approaching disease (2). In a state of health the gingivae are pink and lustrous in appearance, with the cemento-enamel junction being covered around the entire circumference of each tooth, filling the interdental spaces to the contact points of the teeth.

Upon exploration with a fine blunt-

pointed probe, there should be firm resistance at the cemento-enamel junction or floor of the gingival crevice. Both the labial and lingual gingivae have a symmetrical contour, without the puffed or buckled appearance often noted when disease is present. The marginal gingiva should terminate in a thin knife like edge. The healthy appearance of gingiva is seldom noted in the adult mouth. We have therefore grown so accustomed to observe the different stages of disease in the process of development, that we are prone to overlook the importance of these early warnings. It is a serious mistake to wait until we discover the actual flow of pus from around the teeth before making a diagnosis, and instituting treatment.

The radiograph is often an essential part of the routine in diagnosis, as pockets frequently exist where the gingivae are nearly normal in color, with no deposit visible, and apparently the tissues are in normal contact with the tooth, but the radiograph, and a fine blunt-pointed probe may reveal a lesion of great depth. Upon careful examination of the occlusal contacts in such cases there is nearly always an incordination in their relationship.

The eye should be trained to detect the slightest deviation from the normal appearance in the gingivae, as abnormal color usually indicates the presence of an irritating deposit, a filling with a protruding margin, or some other cause for the disturbance of circulation and in most cases the chief cause will be found in malocclusion. The prompt recognition and treatment of chronic gingivitis is of inestimable value, since it is usually the primary lesion which precedes the destruction of periodontal tissues.

The most destructive type of gingival lesion that has demanded the consideration of the practitioner of dentistry in recent years, is acute ulcerative, or Vincent's phagedenic, gingivitis, commonly known as "trench mouth" (3). It is recognized by a grayish white ulcer on the crest of the marginal gingivae, either labial, lingual or proximal, with a bright red line underneath (4). It is usually accompanied by severe pain, tenderness to touch, and a characteristic malodor to the breath with hemorrhage from slight irritation, or it is sometimes spontaneous. The attack is usually sudden, there is no visible pus, but the spirochete and fusiform bacillus are always present in the form of microorganisms.

In the most acute attacks there is loss of appetite, insomnia, mental depression, salivation at times, slight chills and temperature, and the patient may be incapacitated for work. The teeth are usually firm and there are no pockets or recession unless they existed previously. The disease is very frequently observed in the mouths of cigarette smokers and the excessive use of cigarettes is believed by some observers to have a predisposing influence in its etiology. It is most often found in the mouths of males between the age of twenty and thirty years, but does not attack the mouth that is given adequate prophylactic treatment. This disease is not only infectious, but is contagious, and scrupulous care should be observed to prevent its spreading.

Treatment

It should be treated upon the same principles as common periodontoclasia. When a patient first presents for treatment, owing to the virulence of the microorganisms, it is imperative that the intensity of the infection be reduced before any further procedure in treatment can be considered. Extractions, curettement, or surgical treatments are absolutely contraindicated until there has been a numerical reduction of the invading organisms.

A method of procedure which has given very prompt relief is the use of Churchill's iodin, first, with an application of 10 per cent silver nitrate following immediately and permitted to remain about thirty seconds before washing away excess with water. Teeth should

be isolated with cotton rolls and napkins and dried before making application.

The use of a mouth wash composed of sodium perborate, one teaspoonful in a glass of warm water used every hour, a fresh solution to be made each time. Within one or two days the careful removal of concretions from teeth may be considered, using great care to prevent injury to the soft tissues, and prophylactic treatments continued daily until all indications of disease have subsided. It is advisable to continue the use of sodium perborate for several weeks, and keep the patient under observation from six to twelve months.

Procedure in the treatment of periodontal lesions must be directed in accordance with diagnosis in each individual case. All forms of periclasia are inflammatory (5). Therefore after identifying the cause it is necessary to pursue a course of treatment that will remove it. When a patient presents for treatment a thorough examination is essential, using a chart for recording such conditions as may be found in both hard and soft tissues of the mouth, supplementing this by radiographs, plaster models and vitality tests. When the general health of patient is not satisfactory, a physical examination should be made by a physician. Relief of congestion by removal of all irritating substance so that the reparative forces may become active should be the primary consideration. Various etiological factors should be given in their sequence, the attention demanded to remove their cause. Traumatic occlusion, which is nearly always a factor, should be given the most thoughtful attention. Its presence may be detected by placing the index finger upon the suspected teeth, requesting the patient to exercise the teeth in the various mandibular movements. The teeth involved will impart a sensation of excessive movement to the sense of touch.

To correct this, place a piece of carbon paper between the teeth with instructions to patient to give the occlusive movements of jaws which will indicate by stains, the points of contact that are in traumatic occlusion, and need grinding. This should be repeated until those teeth in traumatic occlusion are sufficiently relieved to give them rest.

The removal of concretions, or the heavy scaling of deposits from all tooth surfaces, will relieve the intensified inflammation, and prepare the gingival tissue for prophylactic scaling, or the removal of the thin frosty deposits from necks of teeth underneath the free gingival margin. With a suitable dentifrice all exposed tooth surfaces should be thoroughly polished, giving special attention to approximal areas which can be best accomplished with abrasive tape.

All teeth showing hopeless periapical, or periodontal destruction should be removed and suitable restoration made to prevent shifting of teeth, as well as restoring the masticating surface.

The most exacting, as well as the most essential procedure in the treatment of periodontal lesions, is the curettement of denuded root surfaces. Anything less than the most perfect technic in root surgery is sure to result in disappointment and failure. The chief objects sought in the treatment of periodontal lesions, are the removal of infection from the oral cavity, and the improvement of the general health, as well as bringing the mouth back to as near normal condition as possible. It is necessary to proceed further than mere prophylaxis, if lasting results are to be anticipated.

The necrotic bone and cementum as well as the other infectious substances must be removed from the diseased area. To accomplish this result most effectively, and with greatest degree of comfort to patient, it is preferable to resort to block anesthesia, in all cases in which pockets have developed to any marked extent.

It is good practice to excise gingival tissue on labial and buccal surfaces which have lost their alveolar attachment,

where there is no hope of regeneration. This does not apply to second or third molars, except in suitable cases in the maxilla. There is no objection to making incision of gingivae on lingual surface to the depth of the pockets, to give free access of curettes to diseased root surfaces, and prevent injury to the soft tissues. With correct surgical technic there is neither pain nor soreness following such procedure.

The instruments designed for root surgery are of varied types, but it makes little difference which ones are selected, provided the operator is familiar with their use, and has acquired the delicate sense of touch which is absolutely essential in the successful treatment of periodontal disease. I have been able to accomplish most pleasing results with curettes, supplemented by files, using great care to keep the curettes with keen sharp edges, as a dull instrument can not be used to advantage in root surgery.

It is very important that the field of operation be kept as free as possible from contaminating influences. Therefore the frequent irrigation of pockets with a solution such as Dakin's is advisable as a routine. Cotton rolls and napkins should be used to keep the saliva under control.

After thorough curettement has been completed, a slight hemorrhage should be encouraged and then checked by applying cotton tampons dipped in hot water, squeezed in napkins, and cooled sufficiently to be tolerated by the soft tissues. Repeat until the hemorrhage has ceased and a blood clot formed.

The necks of teeth and gingivae should now be thoroughly cleaned and dried with pellets of cotton, and the entire field of operation sealed over with a solution of warm wax and iodoform used as a dressing. This dressing will remain intact and protect the parts for two days, at which time it should be repeated; the same treatment being continued until the parts are thoroughly healed.

The above formula is suggested by Jules J. Sarrazin, and is composed of beeswax 120 grains, hard or sticky wax used in bridge and crown work 40 grains, and iodoform 20 grains. The dressing is prepared by melting the beeswax in a small container, adding the hard wax, then stirring the iodoform into the mixture while the mass is congealing. This dressing has given wonderful results.

The periodontist who succeeds in the eradication of disease of the investing tissues of the teeth must not only be skillful in the manipulation of instruments, but also an instructor of no mean ability, as the future welfare of the mouth is intrusted to the patient at the time of dismissal and a satisfactory state of health can not be maintained unless the patient has been convinced of the importance of home prophylaxis, and instructed in the correct method of caring for the mouth. Various methods of brushing teeth are, rotary movement of brush, the straight up and down or sweeping movement, and the latest suggestion which has come from W. J. Charters (6). All these methods have merit, but Charter's method has distinct advantages when correctly observed, by virtue of the stimulating effect upon the gingivae, as well as accomplishing the removal of all unattached detritus from teeth, including that which finds a resting place under the free margin of gingivae.

In conclusion permit me to say, that it is of the utmost importance that the primary lesion be recognized, and a vigorous campaign of prevention be inaugurated before the disease has progressed to any marked extent. It is much easier and far better to prevent than cure, and if prevention were only practiced with a part of the enthusiasm with which it is discussed in our conventions, or written about in our journals, much greater good would be accomplished, and many teeth that are intelligently filled and cared for otherwise,

could be saved from the ravages of periodontal disease.

It is quite certain that periodontal lesions are serious enough to challenge the attention of every thoughtful practitioner and *does*, but in most instances in the advanced stages of development. This is regrettable, because periclasia can be most effectively prevented if recognized in its incipiency, correctly diagnosed and the necessary preventive measures applied, but usually the primary stages are viewed as innocuous lesions, and extensive tissue destruction has occurred before the serious aspect of the disease is recognized. Under skillful management, many cases may be cured, but much greater good might be accomplished through prevention, rather than await the development of the advanced stages of the disease and attempt the more difficult feat of affecting a cure.

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Discussion

Frank C. Pague, San Francisco, California: We must acknowledge that the mouth of man is deteriorating much faster than any other part of the body, by the poorly prepared foods lacking in those essentials of bone development and tissue nourishment so essential in the development and growth of the child, and because of such foods, the teeth and jaws are not perfectly developed, and must necessarily be more susceptible to the onslaught of disease than other tissues of the body.

In close observation and study of causes for periodontic conditions that have come under my observation in the past thirty years, I am fully convinced that constitutional conditions have little or nothing to do with periodontic causes, but rather all are of local origin. The indiscriminate extraction of teeth permits shifting of adjacent teeth, and rapid development of periodontic conditions through trauma. This can only be controlled by mechanical restorations and correct occlusion.

If the general practitioner in advising his patients would impress upon them the necessity for immediate restorations, where extractions are indicated, much of this trouble could be avoided, and if these same dentists would carry their observation farther and see to it that all crowns they feel compelled to place in restorations, fit perfectly at the gingivae and do not encrouch upon the soft tissues, that all fillings and inlays have smooth, polished surfaces at the gingival borders, that dentures are constructed with like consideration for tissues surrounding the necks of the teeth, these irritating causes could be avoided and many more teeth would be saved from the ravages of periodontic disease.

The percentage of malposed teeth that are responsible for periodontic conditions is enormous. Trauma is ever in evidence, and unless such teeth are properly corrected in occlusion and contact points placed in harmonious relation in early life, little else than periodontic trouble can be expected. With the orthodontist and periodontist working in sympathy, one with the other, to relieve and correct these irregularities in early life, the periodontic conditions of today which we find in the mature patient will be eliminated in generations to come.

The surgical treatment is very often necessary to obliterate existing pathology, and obtain healthy granulations. It is our practice in treating these conditions, (after block anaesthesia) to remove all gingival tissue, both buccal and lingual, where these tissues have lost their attachment to the depth of the pocket, to curette all necrotic bone, smoothing its surfaces, remove the deposits from the root surfaces, smooth and polish them by thorough surgery, and after all is finished, make a dressing by mixing olive oil, clove and sassafras oil with zinc oxide, reisin, etc., making a thin paste of creamy consistence, and packing it between and about the root surfaces overflowing to and covering the gum margins, thus making a firm covering protecting the soft tissues from bacterial invasion, and permitting the parts to readily and quickly heal, because this paste hardens under saliva and is easily applied. I believe it would be preferable to use the method suggested, namely, attempting to flow hot wax over wet surfaces, which all realize is a difficult procedure.

REPORT OF THE RESEARCH COMMISSION[1]

By FRANK O. HETRICK, Chairman, Ottawa, Kansas

THE past year has shown a progressive growth on the part of the Research workers and their problems. It has been the policy of the executive board of the Research Commission to continue in universities, the grants where good work is being accomplished and the real spirit of Research is manifest. We have a number of requests for the coming year, for new grants at such places where the equipment, problems and workers suggested, are up to our standard. I recommend that these grants be made, insofar as our finances make them possible. We also have some requests for increases in the amounts, as granted last year to directors and workers who are already doing splendid work. I recommend that all be granted. I feel that this commission will accomplish more for humanity by stimulating the spirit of research in many places, than by any other method. The universities have expensive equipment and are willing that we may share with them in research. In no place do we pay the full salary of a worker and neither does any of the directors receive a penny's salary, but give their valuable time and services.

We have left to the discretion of the director and worker the time for publication of the results of their research. The chairman and secretary have had reports from all those conducting different problems. Some have been published, with due recognition of our commission; others only reporting such progress as their research has shown. Some of these reports and the results of their endeavors up to date, will be given at this meeting. Other problems that are vital, need much time for their final report and at present, are only reporting progress. These grants should be continued and increased, particularly is this true of the problems of nutrition. We have new requests for grants to aid research upon this problem. It is gratifying that some states that have not been paying their dues into the research fund have come into line and are now paying their quota. Some very few other states are considering withdrawing their support. This is not alarming and should not be considered so; as I feel sure, after a thorough understanding of the work being done, that they will continue in the line of forward march. It is not to be expected that we could please every individual, but I am sure that in the final analysis those who do not share in this great work will be more than dissatisfied that they did not have a part in this great work for humanity.

Research is not confined to individuality or locality. I honestly hope that we may have the loyal co-operation of *all* the dentists and entire membership of the American Dental Association. All of you who are at this meeting must have learned before this that what makes California so *great*, is the spirit of California. Let us apply this spirit to our research work, working patiently for the solving of the

[1]Annual report of the Research Commission to the House of Delegates of the American Dental Association, July 17-21, 1922.

great problems that lie just beyond our physical vision. There will always be some great problem confronting our profession. Within the memory of many men now practicing dentistry, the pendulum has swung far out and then back, and out and back again, until the proper methods of procedure became confusing. The X-ray illuminated the utter folly of following some "emancipator," who was pointing out some new or better method of procedure which he had not established by proper research. He was acting up to the best of his knowledge of the time and so were his followers.

More is expected of our profession today than ever before and there will be more demanded of it tomorrow. Research work should help standardize our methods of procedure of preventive, as well as restorative practice. I mean by that, to establish a universally recognized method, such as Dr. Black's method of cavity preparations, is now received by a great majority of our profession. I need not go into detail as to the many unsolved problems that are confronting us, many of which are shunted onto us by the medical profession. We should work in absolute harmony with the medical profession; but should be in position not to have to surrender our dignity. If we have the necessary knowledge, we will not be called upon to surrender our judgment to one who may know even less of conditions than we should. We need not be dreamers, but we must have vision. We must see beyond our present attainments and look with unbiased minds and broad comprehension for that which lies beyond. Truth should be the goal of our ambitions, and we should not be swept aside by pre-conceived or personal ideas; but with an undaunted faith, work for the establishment of truth. I submit a part of the Secretary-Treasurer's report as illuminating the progress of the work of the past year and what is asked of us for the budget for the coming year.

Condensed Statement From R. H. Volland

The workers under all grants report that ample opportunity is given for conference with other scientific men who are qualified to lend aid and service on certain phases of the work. This condition especially prevails when the grant is located in a broadly organized educational institution. It is reported also that advantage of the arrangement is freely taken. Again the workers under all grants report that much equipment and material outside their own laboratories is at their disposal and is being used by them.

Workers marked with a * are the only ones receiving pay from the Commission:

University of Minnesota.
Investigation;
1. Relation of surface tension of the medium to the growth of bacteria.
2. Starch digestion in the mouth.
3. Serum test for tuberculosis.
4. Source of the infection of inflammatory type of Bright's disease, glomerulenephritis.
5. Source of infection of other forms of Bright's disease.

Director, T. B. Hartzell.
*W. P. Larson,
*E. T. Bell,
*Mrs. Robert Green, (½ year)
*Mrs. Rorbakken.

Forsyth Infirmary.
Investigation;
1. Dental Caries.
2. Pyorrhea.

The effect of restricted diet in relation to these and other associated conditions is being studied.

Director, Percy R. Howe.
*Ruth E. Hatch,
*Guttoem Toverud,
*E. J. McGinnis.

Northwestern University.
Investigation;
1. On condition of apices of the teeth which have been treated.

2. On the permeability of dentin and cementum.
3. Completing researches on the efficacy of tooth pastes and mouth washes in controlling acidity and as germicides, washes.

Director, A. D. Black.
*W. G. Skillen.
Chicago College of Dental Surgery.
Investigation;
Changes that take place about the apices of the teeth with partially filled root-canals and similar associated problems that can be studied by histological methods.
University of California.
Director, Guy S. Millberry
*J. A. Marshall.
Henry C. Ferris.
Investigation;
Relation of saliva to pathological conditions, oral and systematic.
Director, Henry C. Ferris.
Collaborator, E. E. Smith.
*E. V. Graves, Technician.
Dental Index Bureau.

This grant is being used to prepare a classified index of everything that has been published in the English language in our periodical literature. The 1916 to 1920 Volume was issued in January 1922; 1839 to 1880 Volume is now being prepared as is the 1921 Small Volume.

"It is proposed to issue a small paper-backed volume annually, for four years, 1921 to 1924 and then combine those four years in cloth binding, thus making 1921 to 1925 volume.

Director, A. D. Black.
*Gladys E. Sherman, Cataloguer.
*Olga Griswold, Stenographer.
*M. Malling,
William Bebb.

Fourteen workers receive pay from the Commission; twenty-five workers are directly interested and working on problems; eighteen problems or pieces of work are being done; thirty to fifty thousand dollars worth of equipment is being used by these workers. This does not include rooms, furniture, light, heat, water, etc.

REQUESTS

			Total Amount
University of California.			
Dr. J. A. Marshall	$1200		
Technician,	800		$2000.00
Northwestern University			2400.00
Dr. Hatton,	1500		
Dr. Skillen,	1500		3000.00
Dr. Percy R. Howe			3000.00
University of Louisville.			
Dr. Theo. Buest,	1500		
Dr. Homberger,	1800		3300.00
Dental Index Bureau			3000.00
Creighton University.			
Dr. J. S. Foote			1000.00
John Hopkins University.			
Dr. McCullom's Biochemical Laboratory, Directors, Drs. McCollum, C. J. Grieves and Streeter ask for			4000.00
(withdrawn)			

	per year for 2 years.
Chicago College of Dental Surgery	$2400.00
Henry Ferris, continuation of grant,	1000.00

LIST OF GRANTS MADE BY RESEARCH COMMISSION OF THE AMERICAN DENTAL ASSOCIATION, LOS ANGELES, CALIFORNIA, JULY 17-21,1922.

University of California, College of Dentistry	$2,000.00
Northwestern University Dental School	2,400.00
University of Minnesota, College of Dentistry	3,600.00
St. Paul Orphanage (Dr. Marion Stevens)	600.00
University of Michigan, College of Dental Surgery	1,800.00
Dr. Percy Howe	3,000 00
Chicago College of Dental Surgery	2,400.00
Dental Index Bureau	3,000.00
Dr. Henry C. Ferris	1,000.00
Creighton University, College of Dentistry	1,000.00
University of Louisville, College of Dentistry	1,500.00
Total	$22,300.00

R. H. Volland, Secretary.

I submit Weston A. Price's report in reference to the Research Institute at Cleveland and will state that the lease is in the hands of the Trust Company in Cleveland and cannot be turned over to the commission or the Board of Trustees of the American Dental Association until all obligations upon the property are

paid. It will then be turned over to the Trustees. The second mortgage has been paid in full and the first mortgage reduced to approximately $21,500. Dr. Price's report was made in February, 1922, and there had been two payments upon principal and interest, which reduces the amount from $23,000.00 to $21,500.00 at the present time. There have been some payments upon subscriptions and we have promises which we hope will be paid and that we may have approximately $1,000 to apply on our indebtedness in November, 1923.

Collections have been slow, owing to the general depression, and some have refused to pay their subscription, claiming they were abrogated by the leasing of the property. However, we have hopes that most all of the balance of the unpaid subscriptions will be liquidated.

Information Regarding the Research Commission of the National Dental Association

We submit herewith, the report of the activities, financial and otherwise, of the Institute since in closing in 1920. In accordance with the resolution adopted at the annual meeting of the Corporation in July, 1920, the work was terminated. Doctors Meisburger, Brown and King, the committee on the sales and distribution and equipment, etc., proceeded with its work and the Trustees in accordance with the instructions of the Corporation, negotiated and consummated a ninety-nine year lease for the property. The sale of equipment was conducted by an advertised sale, the proceeds of which amounted to $4,958.45, and the major part of the equipment was sold to the Western Reserve University. The building and property were leased on a sliding term, beginning with $4,549.25 for the first five years; $6,823.80 for the second five years; $9,096.40 for the third five years, and $11,375.00 for the balance of the ninety-nine years, namely, eighty-four years, with the privilege of renewal at the latter rate. The property was leased to the Euclid East Eighty-Eighth Company and is being used for a hospital and clinic by a group of medical men. The lease went into effect September 1, 1921, and we are receiving quarterly $1,137.30. The rates are based on land values, beginning at $1,000 a foot and going to $2,500 a foot. The total cash receipts for the ninety-nine years will be a little over $1,000,000. Our net investment at the time of leasing, as principal and interest, is about $26,000, during a period of six years, an average of approximately $4,333.

Our average income during the period of the lease during the ninety-nine years will be nearly $1,100 per year. The purchase price of the property $47,500, was at the rate of $632.00 per foot; the lease price net $2,375 per foot. At the time of closing, there was a first mortgage of $27,000 and a second mortgage of $3,250, a total of $32,250. With the proceeds of the sale of equipment, the two quarterly payments from the lease and the receipts from the Research Commission as subscriptions to the building fund, we have paid since September 1, 1922, the following: Interest, $2,488.09; principal, $7,250.00; expense of Committee on sale of equipment, $329.68; expense for making the lease, $121.80; annual fee of the Guardian Savings and Trust Company for acting as trustee, $25.00 (trustee selected by the Trustees of the Corporation); accumulated bills incident to maintaining and closing the Institute, $55.25.

The second mortgage has been entirely liquidated and the first mortgage reduced from $27,000 to $23,000. We do not have a memorandum of the total subscriptions that were made to the building fund at the New Orleans meeting in 1919. These are in the hands of the chairman and secretary of the Research Commission and the Secretary of the American Dental Association.

The resolution which provides for the closing and leasing of the Institute, pro-

vided that the income should be used first, for the payment of the obligations of the corporation, after which it should be paid to the Research Commission for the carrying on of Dental Research.

Respectfully submitted,
Weston A. Price.

Too much credit cannot be given Weston A. Price for the grand work that he did in building up this department of our professional activities, and that his name may be known as the moving spirit in our early struggles, the Research Commission has taken the following action:

Resolved: That after all obligations are paid upon the Research Institute of Cleveland, that the funds received from the leasing of the property, shall be known as the Weston A. Price Research Commission Fund. All honor to this grand man. We believe that better work is being done in our department each year and we most earnestly hope that we may see no backward steps in the years to come.

Respectfully submitted,
Frank O. Hetrick.

AUDITOR'S REPORT

Iowa City, Iowa, July 1, 1922.

Dr. R. H. Volland, Treas.,
S. F. & R. C. of the N. D. A.,
Iowa City, Iowa.

Dear Sir:

I herewith submit report of the condition of your account as treasurer beginning June 30, 1921 and ending July 30, 1922.

RECEIPTS RESEARCH FUND

June 30, 1921, Balance	$20,969.60
Annual dues State Society	23,999.10
Interest	640.09
Individual Contribution	5.00
Total	$45,613.79

DISBURSEMENTS RESEARCH FUND

Office Supplies	300.02
Meetings	63.28
Misc. Expense	107.50
Hartzell	2,983.90
Howe	1,527.00
C. C. of D. S.	900.00
D. I. B.	2,852.55
N. W.	1,200.00
Ferris	1,000.00
California	900.00
June 30, 1922, Balance	33,779.54
Total	$45,613.54

RECEIPTS BUILDING FUND

June 30, 1921, Balance	$ 160.00
Secretary	3,250.00
Total	$3,410.00

DISBURSEMENTS BUILDING FUND

Research Institute	$3,310.00
June 30, 1922, Balance	100.00
Total	$3,410.00

RESEARCH MONEY DEPOSITED AS FOLLOWS:

First National Bank of Iowa City	$14,639.45
Farmers Loan & Trust Co., Iowa City	19,140.09
Total	$33,779.54-(500)

BUILDING FUND

First National Bank, Iowa City,	$100.00

CHECKS NOT YET PRESENTED FOR PAYMENT

No 252	$ 25.00
No. 260	25.00
No. 268	75.00
No. 272	27.25
No. 273	75.00
No. 274	75.00
No. 275	125.00
No. 276	100.00
No. 277	48.00
No. 278	10.00
No. 279	100.00
No. 280	9.00
No. 281	25.00
No. 282	88.82
Total	$808.07

Respectfully submitted,
(Signed) J. Gaten, Teller.
First National Bank of Iowa City.

BULLETIN

In addition to the report of the Activities of the Commission already submitted, the matter of a grant to the Louisville University, College of Dentistry, Theo. Von Beust, Research worker, was left for the chairman and secretary to find a problem.

The following problem has been selected: "The Influences of Metabolic Processes on the Enamel of Teeth." Dr. Von Beust will do some work on the problem of "brown stain and mottled enamel," that is giving so much trouble to the dentists in parts of Texas, New Mexico, Colorado, Wyoming and Arizona. T. M. Murphy of Temple, Texas,

presented this matter to the Research Commission at its meeting in Los Angeles. The chairman promised Dr. Murphy that he would take the matter up with the dentists of Amarillo, in the Pan-handle of Texas on his way home from Los Angeles, as he was stopping there to visit some friends. It was also taken up at a subsequent meeting October 6, 1922, at which time the dentists of Amarillo, agreed to try and get a meeting of the West Texas Dental Society for such a time as the chairman might be there, to make a survery.

The Amarillo men got busy with the officers of the West Texas Dental Society and the committee of the West Texas Dental Society upon this subject. The West Texas Dental Society and the dentists of Amarillo are financing the expenses of the meeting and Percy Howe of Boston, Massachusetts, has agreed to accompany the chairman to a meeting of that society, January 29, 1923. The object of this meeting is to collect all the data possible and material and see if the causes of "brown stain and mottled enamel," might not be solved; and the work assigned to Research workers, specially qualified.

Much work has been done upon this problem already by Dr. McKay of Colorado Springs, the late G. V. Black of Chicago, Weston A. Price of Cleveland, and C. D. Wofford of Plainview, Texas, and Leon Williams. The chairman is in hopes of securing the co-operation of Leon Williams to assist in promoting this Research. He read a very interesting paper recently at the meeting of the Ohio State Dental Society in December. Reports from other Research workers upon the problem as indicated, are progressing very satisfactorily and we hope to have a number of fine reports for the meeting in Cleveland and for the *Journal of the American Dental Association.*

The meeting in Amarillo, January 29, will be no expense whatever to the Research Commission, but the chairman will heartily recommend a grant for the prosecution of this problem, as soon as we get it upon a working basis. This work comes directly in line with the work outlined for Dr. Von Beust and he is much interested.

I just want to add this in closing. You will notice by this report, that very little money is being expended for meetings of the executive board and for office expenses of the chairman and secretary. In other words, the administration of this fund is costing almost nothing, the money nearly all being used for work on Research problems.

F. O. Hetrick,

Ottawa, Kansas, January 1, 1923.

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Editorial Department

RESEARCH WORK IN THE AMERICAN DENTAL ASSOCIATION

There is an apparent lack of knowledge on the part of many of our members with reference to the present activities of the Research Commission. Since the closing of the Research Institute at Cleveland a rather widespread impression seems to have gone forth that research work was being abandoned by the association, and that there was no longer any need for further contributions either by individuals or by state societies. If our readers will only turn to the Report of the Research Commission by its chairman, Frank O. Hetrick, in this issue, they will get some conception of the present status of the Research

movement in our organization. The secretary's financial report which appeared in the *Journal* (September, 1922) lists the total contributions, by states, to the research work.

Assuredly it is making progress and while there is of course little that is spectacular in the situation, there is none the less a very encouraging development going on that will ultimately result in some very concrete findings. Research work is seldom spectacular and consequently it does not readily appeal to the rank and file. It is for the most part a slow plodding persevering problem, and is absorbing only to the man who is following it. Therefore it is not strange that so many men in the profession are indifferent to it. Without research we would make no real advancement, and it is surely incumbent on the American Dental Association to foster it in every way possible.

Most of the research in the past has been done by private individuals without endowments or the support of organizations, and it has accordingly been accomplished at a great personal sacrifice to the individual, and often to the serious jeopardy of his legitimate interests. Nothing but the pure love of research has impelled most men to pursue it, and very many of them have been obliged to fall far short of their greatest possible achievement through the sheer necessity of doing something else that would bring them a livelihood. Granted that a man's enthusiasm is a great impelling force, there still remains the fact that men must eat in order to live, and it is a notorious fact that research work *per se* produces very little food.

What is more appropriate then, or more commendable, than that a large organization such as ours should provide the means whereby research may be carried on without too much personal sacrifice on the part of the individual? The present plan whereby grants are made to different institutions to carry on certain special lines of investigation seems to be the most feasible and economical means of accomplishing tangible results. As pointed out in the report, these institutions have much valuable equipment which is always at the service of the investigators, and this one item means a great saving in expense. Not only this but a goodly portion of the cost of research work, such as salaries, supplies, etc., is born by the institution, there probably not being a single instance in which the grant covers all of these items.

It would, therefore, seem very apparent that it is not only logical, equitable, and advantageous for the association to carry on this work but that it is really its bounden duty, and we feel very sure that when the membership generally becomes sufficiently familiar with what is being done by the Commission it will receive a support that is practically unanimous. Let us rally around our research men and show them we appreciate what they are doing, and thus encourage them to "carry on."

OBITUARY

ORD M. SORBER

Ord M. Sorber, assistant professor of Operative Dentistry at the University of Pittsburgh, died in that city on Tuesday, December 5, 1922.

Dr. Sorber was born December 14, 1867 at Stoyestown, Pennsylvania, where his father, M. V. Sorber, had practiced dentistry for many years.

ORD M. SORBER

Dr. Sorber was graduated from the University of Pittsburgh in 1898. He entered the Dental Corps of the United States Army in 1900, was stationed in the Department of Texas for three years, then in the Philippine Islands until 1907, when he resigned from the service.

After an extended trip through China and Japan he returned to Pittsburgh and began private practice devoting part time to demonstrating operative dentistry at the University of Pittsburgh. A few years later he was placed in charge of the dental office established by the Armstrong Cork Company of Pittsburgh for its employees. This was probably the pioneer effort in Industrial Dentistry. Dr. Sorber remained for several years with the Armstrong Cork Company only giving up the work in 1914 on account of a physical breakdown due largely to overwork and probably to some extent induced by his service in the Philippines. About two years later, having somewhat recovered, he became a full-time instructor at the University of Pittsburgh ultimately being elected assistant professor of operative dentistry.

As a teacher of operative dentistry, Dr. Sorber was without a peer. Unusually skillful as a technician, he was not only a mechanical genius but also a broad-minded student and well versed in the academic and medico-dental sciences which form the foundation of modern dental education. His wide experience in general practice, in industrial dentistry, and in his seven years in the Army Dental Corps developed in him a resourcefulness in overcoming difficulties and a mastery of technic that were considered marvelous by all who had the opportunity to receive his instructions.

In addition to his admirable characteristics as student, scholar, technician and operator, he possessed to a remarkable degree the ability to teach—not only to impart his knowledge to a student, but to develop in such student an intense interest in his work; to recognize the student's difficulties and to train him to overcome them. His particular forte lay in the field of individual instruction, and for the

past five years his whole time had been devoted to teaching juniors and seniors in sections of from two to eight students.

While being a man of definite and uncompromising principles, Dr. Sorber was so gentle in manner and kindly in disposition, so unselfish in his actions, and so willing at all times to be helpful to those needing help that he not only merited but received the respect and the love of all who came in intimate contact with him.

He leaves his mother, Mrs. Lavina C. Sorber, of Stoyestown and two brothers, M. P. Sorber of Wilkinsburg, Pennsylvania and J. J. Sorber, of Montreal, Canada.

Isaac Burnett Davenport

Isaac Burnett Davenport was born May 12, 1854, at Tracy Creek, Vestal, Broome County, New York and died in Paris, France, on November 4, 1922. He was reared on the farm where he was born, and attended short terms of public school supplemented by his mother's experience and aid. He attended the normal class of the Binghamton, New York high school, which enabled him to obtain a license to teach, and he taught one term of four months, when nineteen years of age.

In 1874 he entered the dental office of A. F. Davenport, his father's cousin, at North Adams, Massachusetts. At the same time he began a course of reading under the direction of physicians. Feeling the need of a knowledge of Latin, he made arrangements for private tutorage. He took a course in medicine in the College of Physicians and Surgeons in New York City, where he was graduated with the degree of Medical Doctor in 1879. He spent the summer of that year in hospitals and dispensaries in New York, and began specializing in eye and ear work, as he expected to follow that speciality. As his funds became exhausted, he was forced to give up New York and decided to return to the practice of dentistry. He passed the examination of the board of Censors of the Dental Society of the State of New York in 1887, and received the degree of Master of Dental Surgery.

He first practiced at Williamstown, Massachusetts, where he became a member of the Medical Society of the Northern Berkshire, the American Dental Association, and the Connecticut Valley Dental Society. He read papers before these societies, including one in 1881 before the American Dental Association on "A Study of the Etiology of Chemical Abrasions on the Cutting Edge of the Front Teeth." He was influenced by a New York dentist who was a visitor in Williamstown to go to Paris in 1883, where he formed a partnership with Drs. Bogue, Moffatt, Cook and Daboll. The partnership was discontinued in 1887, since which time he has conducted an independent office at 30 Avenue de l' Opera.

Dr. Davenport's contributions to dental science have been of outstanding importance. Perhaps the most important of his papers was the one published in 1887 on "The Significance of the Natural Form and Arrangement of Dental Arches of Man." A continuation of this subject was given at a meeting of the American Dental Society of Europe, at Heidleberg, in 1892. These papers had an important influence in discontinuing the pernicious practice of filling and extracting of teeth, particularly against extraction of the first permanent molars.

Dr. Davenport has been honored by many societies of his profession. He was an honorary member of the Odontological Society of New York; associate member of the Institute of Stomatology of New York; associate fellow of the American Academy of Dental Science of Boston; member of the American Dental Association; member of the Society of Stomatology of Paris; member of the American Dental Society of Europe; member of the French Society for the Advancement of Science; member of the Foreign Relations Committee of the National Association of Dental

Faculties; member of the Organization Committee of several International Dental Congresses.

In 1898 he received from the reigning Prince Luitpold of Bavaria the decoration of Chevalier de l' Ordre Royal de St. Michel de Baviere, for services rendered the Royal Family of Bavaria, especially after the fatal fire in Paris of the Bazar de la Charité. For identification of many of the burned victims, it was necessary for Dr. Davenport to examine the teeth of nearly forty; and, after rejecting a body already accepted by the family upon supposed evidence, he was finally enabled to identify from his work on the teeth a head and trunk with only one arm attached, as the remains of the Duchesse d' Alencon, daughter of the King of Bavaria, sister of the late Empress of Austria, sister of the Queen of Naples, etc. By aid of his record charts of all his operations, he was enabled to establish the identity beyond all question, first to the official medical experts, second police experts, third to the full satisfaction of the family of the victim. Other mistaken identifications were thus corrected. Many questions in jurisprudence are involved in such cases, and the identification must be beyond question. On the first of March, 1907, Dr. Davenport received from the French authorities the decoration of Officer de l' Académie Francais.

In 1921 the officers of the National Dental Association extended an invitation to Dr. Davenport to attend the meeting of the National Dental Association at Milwaukee, for the purpose of paying a tribute of regard to him for his unselfishness and devotion to his profession. It was a matter of very great regret to him that he was unable to be present on that occasion, because he had desired once more to fraternize with his brethren in the United States, for whom he entertained the very highest regard and affection.

Dr. Davenport was greatly interested in the study of bacteriology and histology. He took complete courses of the former in both the College of Medicine and the Pasteur Institute in Paris, under Metchnikoff and Roux, and private courses in histology. He was an amateur photographer of no mean ability. Outside of his professional work, his greatest joy was in the attention which he gave to gardening, at his beautiful country home at Le Vésinet, twelve miles out of Paris.

Dr. Davenport was a man of charming personality; a rare companion and friend. Many members of the profession, not only in America, but throughout the world, are indebted to him for unbounded courtesy and hospitality. He was always ready to do his utmost for the comfort, entertainment and happiness of others. Endowed by nature with a warm, kindly personality, he radiated good cheer and drew to himself the love and affection of all those with whom he came in contact. He was most generous to those in need and ready to extend a helping hand to those in distress or trouble. His benefactions were extended with the modesty which characterized all of his actions.

Dr. Davenport did much to place American dentistry on a high plane abroad by his great skill as an operator and his personality which attracted to him a clientele from the reigning houses of Europe. The high regard in which dentistry is held abroad is largely due to the splendid ability and character of Dr. Davenport and those who were associated with him. For some years various American diploma mills have sold diplomas conferring the degree of D.D.S. in absentia, in foreign countries, thereby disgracing the good name of American dentistry and bringing discredit upon the profession. To Dr. Davenport is due the credit of bringing the matter to the attention of this and foreign governments, with the result that an end has been put to the selling of degrees, for the present, at least.

It is exceedingly difficult, at this time, to enumerate all of the activities with which Dr. Davenport was connected and to pay to his memory the tribute which it deserves for unselfish devotion to his profession and the many kindly acts which endeared him to those who knew him best. His passing away will bring sorrow and regret wherever he was known. Surviving him are his wife, Josephine Victorine Coutin, two daughters; Mrs. André Siegel and Nellie Burnett Davenport, and a son, Ralph S. Davenport, who was associated with his father in practice.

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THE SALIVA OF INFANTS

It is obvious that digestion cannot be satisfactory in early infancy until the essential alimentary secretory functions become properly established. Not many years ago it was often stated that the amylolytic capacities of the infant are not completely developed at birth, and the allegation was used as an argument against the early feeding of any dietary component, such as cereals or cereal decoctions, which contain starch. As an indication of current opinion, one of the most recent textbooks[1] may be quoted. It states that only the parotid of the newborn contains amylase, whereas the submaxillary lacks this enzyme. It appears in the submaxillary gland and in the pancreas only at the end of the second month of life. Furthermore, it is alleged that at birth the amylolytic activity of the parotid is little more than that of many other tissues. However, in a recent examination of the saliva of more than eighty infants in London hospitals, Nicory[2] found ptyalin present at least one and one-half months before term, although only in small quantities. The amount of enzyme increases gradually to the age of one year, when the composition of the child's saliva becomes identical with that of the adult. At all ages the quantity of ptyalin present varies with the general condition of the child, being larger in strong than in weak infants. In view of the fact that an amylolytic enzyme is present in the saliva of babies in appreciable quantities, and that a number of infants fed on milk plus starchy foods manage to utilize a large quantity of the starch, Nicory argues that diastase is present in the pancreatic secretion of infants. In any event, the amylolytic equipment of the baby in early life is not, as a rule, so deficient as has frequently been taught.—*Jour. Amer. Med. Assoc.*, October 7, 1922.

[1] MATHEWS, A. P.: Physiological Chemistry, New York, Wm. Wood & Co., 1920, p. 334.

[2] NICORY, C.: Salivary Secretion in Infants, Biochem. J. 16:387, 1922.

Medical and Dental News

(Dentists will confer a favor by sending to this department items of news of more or less general interest; such as relate to society activities, education, public health, mouth hygiene, etc.)

ILLINOIS

Death Rate One Point Off From Totals of 1921: Chicago's 1922 death rate, as indicated by the figures for the first eleven months of the year, may be slightly lower than that of 1921, according to Health Commisioner Bundesen yesterday. The rate for the first eleven months was 11.07 per 1,000, as compared to 11.08 last year.

Deaths from diphtheria decreased from 678 last year to 495 this year; scarlet fever deaths dropped from 177 to 100, and tuberculosis deaths from 2,134 to 2,046.

On the other hand, pneumonia deaths increased from 1,935 to 2,314, deaths from measles stepped up from 115 to 143, and influenza deaths increased from 97 to 295.

Deaths of babies under one year of age dropped from 5,051 to 4,441.

Health Commissioner Bundesen succeeded Dr. John Dill Robertson, February 1, 1922.

MICHIGAN

Dental Assistant Arrested, Fined: The Michigan State Board of Dental Examiners has of late been administering some corrective treatment in Detroit to dental assistants who, through one cause or another, see fit to enter the field of dentistry without qualifications of a practitioner.

During the early part of the summer rumors were plentiful that in a certain Detroit office an assistant was doing all kinds of prophylactic and pyorrhea work, generally, without hesitation or attempt at concealment. Thereupon, the board arranged that a patient should present himself for prophylactic treatment, which he did and found no difficulty in being served. Whereupon a warrant was sworn out for the arrest of Miss Lilian Burke, an assistant for twenty-five years in the office of Dr. Frank Shattuck, 402 Kresge Building.

Upon preliminary examination Miss Burke was bound over for trial under bonds. The trial was called for Saturday, November 25, last. Before a jury of twelve men in the court of Judge Thomas M. Cotter, Miss Burke was found guilty of the offense as charged in the complaint and fined fifty dollars.

This should have a very salutary effect upon every over-ambitious young woman holding a position as assistant in a dental office of this state. Not only should this case result in good to this class of dental assistants, but it might be contemplated with benefit by some dentists who seek to increase the annual income by methods contrary to the law. It scarcely seems possible that there is anywhere in Michigan to be found a dentist who does not know that his assistant is not permitted by law to do any work in the human mouth. However, for the benefit of such, if there are those, who are unfamiliar with the terms of the dental law, we quote from Section 9, paragraph 4 of the Dental Act of this state:

" *** Employing or knowingly permitting or conducting his business so carelessly or negligently as to permit directly or indirectly any student or dental hygienist, except as herein provided, or any unlicensed person or suspended dentist, or one whose license has been revoked, to perform operations of any kind or to treat lesions of the human teeth or jaws or their dependent tissues, ***" etc.

That is to say, the license of any dentist permitting these acts, specified in

the above quotation, may be revoked or suspended by proper authority.

We experience no pleasure or satisfaction in the discomfort or embarrassment of a brother practitioner; but the dental law is upon the statute books to be enforced. It is to the law that we look for the protection both of our profession and of the public. It is the business of the dental board to see that it is enforced against all alike. Judging from the acts of the board in recent years it plays no favorites and should have the unqualified support of the profession of our state.

As a natural sequel to the above case, the dental board has served notice upon Dr. Shattuck to appear before that body to answer to the charge of violating the provision of Section 9 of the dental law.—Michigan State Dental Soc. Bulletin, January, 1923.

NEW YORK

Average Span of Life Soon to be 65 Years: An average life span of sixty-five years will be attained in the near future, according to a bulletin issued today by the Metropolitan Life Insurance Company. The statement is based on comparison of mortality tables of 1920 and those of 1910. The tables show the death rate for persons beyond 70 in 1920 was slightly less than that of 1910. This is ascribed to the widespread application of what is known about causes and prevention of serious diseases.

OHIO

Report of the Callahan Memorial Committee: Cincinnati, Ohio, December 6, 1922. The activities of the Callahan Memorial Committee extending over a period of four years finds at this hour the completion of its duties, which have been full of interest and accomplishment that is gratifying. Immediately after its appointment, your committee entered upon its duties with a promptness and unity that insured successful results. Deciding that the memorial should be national in character and include two phases: First, a local memorial in this city; and second, a fund to maintain permanently an award in the name of Doctor Callahan.

On presenting the purposes of the local memorial to the officials of this city, their interest was enlisted and the splendid site in the General Hospital Grounds was selected and readily granted by them. This being assured the securing of a fund was undertaken. Realizing the profession's high appreciation of Doctor Callahan's contributions to dentistry, it seems that its members should be given an opportunity to participate in the memorial by contributing to the fund. To facilitate the work a committee of three members in each state was selected. Their co-operation and good offices in securing contributions from their respective states was requested. The resultant efforts which are most gratifying are shown in the financial report of this committee, published in the November, 1922 issue of the Journal of the American Dental Association and also the Dental Summary. In many cases, state and local organizations made their contributions from the treasury of their respective societies; in addition many individual contributions increased the fund from these states. In a number of states the total amount was contributed by individual subscriptions secured through the appeal of the committees. Our committee wishes to express its high appreciation of the assistance of the various state and local committees, and to those who gave so generously of their time in securing individual subscriptions. We wish to make special acknowledgement and we would be remiss if we at this time failed to accord to Doctors W. S. Locke and A. C. Bachmeyer, Superintendent of the General Hospital and his assistant, Mr. I. H. Weisbrod, our sincere thanks for their valuable assistance in things pertaining to the hospital arrangements. As with the dental journals so with the many who have assisted us, the interest and helpfulness has seemed a reflection of the spirit of love and appreciation for the man whose memory we honor today.

The local memorial consisting of a one and two-thirds life sized bronze bust of Doctor Callahan, the work of sculptor Frederick C. Hibbard of Chicago, is in the General Hospital Grounds. This committee in its report to the society, December, 1920 recommended the creation of a Callahan Memorial Award Commission, to consist of seven members elected by the Board of Directors of the Ohio State Dental Society, four of which shall be elected from the membership of the Ohio State Society to serve for a period of four years and three of which shall be elected from the membership of the American Dental Association, and not members of the Ohio State Society, to serve for a period of three years, whose duty it shall be to administer the Fund provided for the

second phase of the memorial, viz: For maintaining permanently, encouragement and assistance in dental research, the Commission shall each year make a suitable award to be known as the John R. Callahan Award in the form of a medal to a person who in its judgment has made a contribution to dental science which is of very exceptional value. This recommendation being adopted, the Board of Directors elected the members of the Commission, who entered upon their duties this year. This moment marks the completion of the duties of the memorial committee. In behalf of this committee I am privileged to deliver to Doctor C. Stanley Smith, Secretary-Treasurer of the Commission the Fund $5,000.00 which insures the perpetuation of the Callahan Memorial Award Commission.

Callahan Memorial Committee:
T. I. Way, Chairman
H. E. Germann
Secretary-Treasurer
Weston A. Price
L. L. Barber
L. E. Custer
E. C. Mills.

National Health Legislation: Out of nearly 18,000 bills and resolutions now pending before both houses of Congress, there are over 250 concerned with some phase of public health. Many of these are, of course, of minor importance and many will never get out of committee. Some of the more important measures not yet acted on are:

1. Child labor—S. J. Res. 224, H. J. Res. 327, H. J. Res. 332, H. J. Res. 340, H. R. 11,707. These resolutions would give Congress power to regulate child labor by means of an amendment to the constitution. No action taken on any of them.

2. Physical Education—S. 416, H. R. 22. The Fess-Capper bill, authorizing federal aid to the state in the promotion of physical education. No action has been taken.

3. Social Hygiene—S. 3544, H. R. 11,490. To transfer the activities of the Interdepartmental Social Hygiene Board to the Department of Justice. No action. S. 1010, Changing Federal statutes regarding punishment of prostitutes. Passed Senate February 17, 1922. Reported House, April, 1922. S. 3470, H. R. 11,021. Control of venereal disease in the District of Columbia.

4. Tuberculosis—H. R. 12,730. To use government hospitals for civilian government employes having tuberculosis. No action taken. H. R. 12,051. Erection of school for tubercular children in the District of Columbia. Reported House, June 3.—Bulletin of the Ohio Public Health Assoc., December, 1922.

PENNSYLVANIA

The Report of Dr. H. E. Friesell, Dean, University of Pittsburgh, School of Dentistry, Pittsburgh, Pennsylvania, giving the total enrollment of all the dental schools in the United States for the year 1922-23 by classes is as follows: Freshmen, 3,318; Sophomores, 2,946; Juniors, 3,681; Seniors, 3,655; Total, 13,600.

FOREIGN

Glasgow Dental Students: A concert was given in the City Hall, Glasgow, under the auspices of the Glasgow Dental Society, in aid of the Society's war memorial fund. Sir Robert Wilson presided. It is proposed that the memorial should take the form of a library for the use of members of the society, and in the building there will be placed a tablet bearing the names of those members who fell in the war. With a view to raising additional funds arrangements are being made for holding a bazaar in May next in the M'Lellan Galleries, Glasgow.—The Dental Practitioner, December, 1922.

GENERAL

Fee Splitting Is a Great Game: As long as there are doctors who possess elastic or perhaps we ought to say no consciences, and the public does not interest itself in being stung, just so long will the iniquitous practice of fee dividing thrive. However, it is a little amusing to a rank outsider to note the howls of protest which go up from the old-time fee dividers when they note that their "business" is slipping from them because rivals, usually younger and often without adequate training or experience, are getting the "business" because a larger commission is offered. Of course, the poor patients' best interests are not considered. In fact, the submissive patient with a mistaken notion concerning the solicitude of his family physician is led blindfolded and hobbled to the highest bidder, where he is made the object of the most mercenary transaction that it is possible to conceive. It is reported that one man has said: "I am going to get mine while the getting is good," but while all this is going on the medical profes-

sion as a whole is getting a black eye which it very justly merits. The innocent may suffer with the guilty, but at least they have the satisfaction of having a clear conscience, and we can not help but feel that even the grafters in the medical profession, in their own hearts, have a very high respect for the men in the profession who are trying to be clean and honest.—Jour. of the Ind. State Med. Assoc., December 15, 1922.

There are two principles that should be adopted as slogans of the American Medical Association and every medical society in the country. The first is: "All medical work shall be done by medical men" and the second, "All medical work shall be adequately compensated."—Jour. of the Ind. State Med. Assoc., December 15, 1922.

Rustless Steel for Artificial Teeth: The rustless steel of the Krupp works is stated to contain a large amount of chrome, and to have extraordinary hardness. It is claimed to be unaffected by boiling nitric acid. It was a wartime substitute for platinum, is particularly adapted to replace nickel-plated metal for instrument making, and is being tried in place of gold and vulcanite for plates for artificial teeth.—The Dental Practitioner, December, 1922.

Public Health—The Science of Life: A new motion picture course of instruction, produced by the Bray Productions, Inc., under the direction of the Surgeon General, United States Public Health Service, entitled, "The Science of Life," provides the first course of visual instruction ever produced to cover the subjects of general biology, communicable diseases and personal hygiene. It is intended for general educational use, and is arranged for showing one, two or three-reel units, according to selection. There are thirteen reels, each approximately 1,000 feet in length.

No description could do justice to such a motion picture. Even still pictures on the subject, though interesting, would fall far short of the accomplishment of "The Science of Life", which begins with the earth before life appeared and goes swiftly into the subject of the earliest forms of life through the study of geology. The simplest forms of life of today are shown in exemplification of the probable way life began. Reproduction in lower forms of life is shown by photomicrograph studies and animated drawings, gradually on to reproduction in the higher forms. The films on communicable diseases show how plants and animals cause disease, the different kinds of bacteria, how they feed and multiply, and the uses of antiseptics, and methods for prevention and cure. The films on personal hygiene cover health habits for young women, for young men, and general health habits.

Special arrangements can be made for showing these pictures to members of organizations in the projection room of the Bray Productions, 130 W. 46th St., New York City, and special prices are made to those ordering several films.—Amer. Jour. of Public Health, December, 1922.

We learn that there are a few misguided members of the medical profession, probably bent upon making money no matter how they make it, who are disciples of one Dr. Abrams, of San Francisco, who has been in the limelight for the last few years as an exponent of a form of pseudo-medicine that is the rankest kind of fakery. To such we recommend the series of articles concerning the preposterous claims of Abrams that have appeared in the Journal of the American Medical Association under various dates and copy of which may be obtained by writing the Propaganda Department of the Association.—Jour. of the Ind. State Med. Assoc., December 15, 1922.

The Causes of Cancer: In the series of articles on new growths in the mouth, in course of publication in these pages, attention is drawn to the frequency with which chronic irritation of the lips or tongue is followed by the appearance of epithelioma. There is an important moral to be drawn from this fact, namely, that it is our bounden duty to assure ourselves that all the mouths we see are freed, as far as possible, from all such sources of irritation. Patients will frequently put up with the slight annoyance caused by ill-fitting clasps, rough edges of dentures, overhanging fillings and suchlike, thinking these things are all in the game and to be borne with patience. It is the duty of the dentist to look for such things, and not to wait for the patient to tell him. When that great moment arrives when the patient states definitely that his new denture is comfortable, after, perhaps more than one visit for easing, it is a great temptation to accept the verdict with a thankful heart,

and let well alone. Nevertheless, it is still necessary to make perfectly sure that no source of chronic irritation has been left unnoticed. There is much more behind the etiology of cancer than simple chronic irritation. Nevertheless, chronic irritation has something to do with it, and must be sought for and removed at every opportunity.—The Dental Surgeon, December 2, 1922.

Accidents During Extraction: There are many accidents that may occur during the extraction of a tooth. In most cases, if harm results, it is the patient that is the sufferer. A remarkable accident, in which it was the operator and not the patient who was damaged, recently occurred in South Africa. The dentist was in the act of extracting a tooth when the patient, a native, expectorated with such force that he succeeded in driving the tooth into the dentist's eye, inflicting rather severe injury.

This particular type of violence is hardly likely to become a habit among patients; nevertheless, it does serve to remind us to be on our guard against possible injury whilst extracting, especially under general anaesthesia. Patients under nitrous oxide, as we all know, sometimes kick out violently, and if the operator is not prepared for this, he may suffer in consequence. The experienced practitioner will generally be able to "spot" the patient who is likely to become violent under an anesthetic, but even so it is well to make a habit of standing in such a position that any unexpected attack can be readily avoided.—The Dental Surgeon, December 16, 1922.

Sarcoma of the Maxilla: We reprint on another page short notes of a case of sarcoma, reported in the Proceedings of the Royal Society of Medicine, involving a considerable portion of the maxilla, with numerous secondary deposits in various parts of the body, shown at a recent meeting of the Laryngological Section of the Royal Society of Medicine. The case was treated by excision of the maxilla, while radium was applied to the secondary deposits.

More than a year has elapsed since the operation. There is no local recurrence, and the secondary growths have to all appearances disappeared.

The case is of interest from more than one point of view. It serves to emphasize once more the paramount importance of a knowledge of the general principles of surgery in dental practice. This is just the type of case which the dental surgeon might well be the first to see; and his provisional diagnosis of malignant disease in an early stage might enable the surgeon to attack the growth at a time when it was still operable.

It should also act as an incentive to those dental surgeons who are Fellows of the Royal Society of Medicine, to attend the meetings of other sections besides the Odontological Section. The Laryngological and Anesthetic Sections, particularly, provide much that is of interest and practical value to the dental practitioner.

Lastly, the apparent success of the radium treatment adopted in this case is of extreme importance. The patient cannot of course, be pronounced "cured" at this early stage in the history of the case. Nevertheless, even if the disease should ultimately recur, the radium treatment has undoubtedly been the means of securing for the patient a welcome respite from a painful affliction.—The Dental Surgeon, December 23, 1922.

Dr. Henry F. Vaughan to Edit the American Journal of Public Health: Kenneth M. Gould, who, during the last year, has given very capable service as Association Editor of the Journal, has resigned in order to accept a position with the Rockefeller Foundation. Members of the Association will receive with much satisfaction the news that the Executive Board has voted to place editorial policy and control in the hands of Dr. Henry F. Vaughan, whose noteworthy record as Commissioner of Health of Detroit has placed his department in the foremost rank of municipal health departments.

No less gratifying is the announcement that Dr. Mazyck P. Ravenel, a former President of the Association, has consented to assume primary responsibility for the editorial section.

At their own request, Drs. Vaughan and Ravenel will serve without remuneration.

Surely, few, if any, workers in the public-health field could be more admirably adapted to their work than these new editors. The Journal bespeaks for them, the co-operation of every member of the Association, and confidently predicts that, as a result of their participation, the Journal will become a more helpful stimulus to public-health develop-

ment, than ever before.—Amer. Jour. of Public Health, December, 1922.

An Awakening—Map Changing Medicine: The awakening of an appreciation by the general public of the importance of sanitary science has long been one of the goals of sanitarians. Judging from recent use of health material and plans for further utilization of it by prominent popular magazines, such an awakening seems to be in the incipient stage, at any rate. The National Geographic Magazine for September carried an article entitled "Map Changing Medicine": Leslies has been writing up the chiropractors, and the Atlantic Monthly published in its July number an article on "Osteopathy, Chiropractic, and the Practice of Medicine": Current History has for its feature article in November a story called "For the Health of the World," by one of our own editorial assistants; and numerous other magazines, such as the Century, Harper's, the American, Woman's Home Companion, Good Housekeeping, and even Hearst's are using material on public health.

Added to the articles are announcements of several popular magazines devoted to health. Doubleday Page has begun to issue a monthly, The Health Builder; the American Medical Association expects to put out a popular health magazine early in 1923; while another national magazine devoted to health has been issued in Chicago for several months. Other important advances include the assumption of the editorial chair of the Nation's Health by Professor C. E. A. Winslow of Yale, and the appointment of Dr. Haven Emerson as health editor of the Survey.

These ethical health journals are greatly needed to offset the unscientific buncombe put out by certain faddists and physical culturists, which, apparently authentic to the layman more or less ignorant of sanitary science, does more harm than good.

This new interest displayed by publishers in the field of health may not be the great awakening of a national sanitary consciousness to which all sanitarians hopefully look forward, but it is a most worthy beginning and an awakening of great promise.—Amer. Jour. of Public Health, December, 1922.

Infant Mortality in the Birth-registration Area of the United States: A record low infant mortality rate for 1921 in the United States birth-registration area is reported by the Bureau of the Census, which has just announced the final figures for that year. The rate was only 76 deaths per 1,000 births, as compared with 86 deaths per 1,000 births in 1920. For the states, the lowest infant mortality rate for 1921 was 51, in Oregon, and the highest 98, in Delaware; for cities of 100,000 population or more the lowest rate was 50, in Portland, Oregon, and the highest, 114, in Fall River, Mass.—U. S. Census Bureau Press Release, October 10, 1922.

Public Clinics Should be Kept Within the Bounds of Absolute Necessity: Dr. Merrill H. Champion, director of the Massachusetts department of health, at the meeting of the American Public Health Association at Cleveland, Ohio, October, 1922, flayed the treatment of disease by the government. He stated that the unwarranted use of material relief whether in the form of food or medical treatment goes to destroy the sense of responsibility on the part of the individual and results in his pauperism, he said. "Public clinics should be kept within the bounds of absolute necessity."—Illinois Medical Journal, November, 1922.

"An Ideal Health Department for a City of 100,000 Population:" Section II from the forthcoming report of the Committee on Municipal Health Department Practice. Prepared by C. E. A. Winslow, D. P. H., and H. I. Harris, M. D., Department of Public Health, Yale School of Medicine.

In the plan of organization proposed, the care of the health of mothers and infants is combined with the supervision of the health of school children in a bureau of child hygiene and the authors outline the essential activities of the two divisions. In regard to the division of infant hygiene, the authors say: "The protection of the health of mothers and young children is perhaps the most important of all the functions of the health department."—Amer. Jour. of Public Health, November, 1922.

"Should the Social Service Departments in Children's Hospitals be Developed into Departments for the Prevention of Disease?" By Howard Childs Carpenter, M. D., Director, Department for Prevention of Disease, The Children's Hospital of Philadelphia. Paper read before the American Public Health Association, Cleveland, October 17, 1922.

The author urges that the social service work of the hospital should be under the direction of a physician, and suggests placing the social service work and public health nursing in the same department,

under one officer who is a physician. It is his opinion that every hospital should have a distinct department for the prevention of disease. He describes in detail the work of the Children's Hospital of Philadelphia where the social service department has been developed into such a department and acts as a community health center for all the children living in the city ward in which the hospital is located.—Amer. Jour. of Public Health, November, 1922.

"The Pre-school Age:" By Mark S. Reuben, M. D., Chief of Clinic, Pediatric Department, Columbia University.—N. Y. Med. Jour. and Med. Record, October 18, 1922.

"Greater Efficiency in Health Work in Schools." By William A. Howe, M.D., State Medical Inspector of Schools, Albany.—Nation's Health, Chicago, November, 1922.

Child Labor and Education: Child Labor Amendment to the Constitution—A joint resolution (H. J. Res. 407) proposing an amendment to the Constitution of the United States which would permit Congress to enact legislation regulating child labor was introduced in the House of Representatives on December 11, by Mr. Foster of Ohio. This resolution is the same as that introduced in the Senate last July by Mr. McCormick, and has the support of representative organizations of women, trade-unions, the National Consumers' League, and the National Child Labor Committee. The resolution reads as follows:

"The Congress shall have power to limit or prohibit the labor of persons under 18 years of age, and power is also reserved to the several States to limit or prohibit such labor in any way which does not lessen any limitation of such labor or the extent of any prohibition thereof by Congress. The power vested in the Congress by this article shall be additional to and not a limitation on the powers elsewhere vested in the Congress by the Constitution with respect to such labor."

"What Becomes of the Unmarried Mother?" By Alberta S. B. Guibord, M.D., Psychiatrist, Church Home Society, Assistant Physician, Boston State Hospital; and Ida R. Parker, Associate Director, Research Bureau on Social Case Work.

This study deals with 82 mothers of babies born between November, 1914, and July, 1918, brought to Dr. Guibord for mental examination. Part I covers the data obtained through these examinations, and Part II is a follow-up study made in 1921-22. The conclusions of the study are presented in tables and charts. Published by the Research Bureau on Social Case Work, Boston, 1922.

An "Eyesight Conservation Day" is proposed by the Eyesight Conservation Council of America, which has its headquarters in New York City. It is suggested that the "day" be observed in the schools twice a year, shortly after the opening of each semester, with the object of discovering cases of defective vision.—Washington Star, December, 10, 1922.

DENTAL CORPS ORDERS FROM WAR DEPARTMENT

Army: Colonel George L. Mason, Lieutenant Colonel Harold O. Scott, Major Benjamin C. Warfield and Captain Leslie S. Harlan having been found by Army retiring boards incapacitated for active service on account of disability incident thereto, their retirement from active service is announced; proceed home.

Captain William E. Sankey, now on duty at Walter Reed General Hospital, D. C., will in addition to his present duties report at that hospital for duty as instructor at Army Dental School.

Captain Glover Johns from duty at headquarters, 1st corps area, Boston, to Fort Williams, Me., for duty.

Captain Lewis W. Maly, now on leave at Fitzsimons General Hospital, Denver, Colo., is relieved from duty in Philippine Department and will report at Fitzsimons General Hospital for duty.

Captain Vivian Z. Brown from duty at Camp Lewis, Wash., to San Francisco and about February 24 to Philippine Department for duty.

Lieutenant Colonel Raymond E. Ingalls from present duties at Walter Reed General Hospital to duty as assistant commandant and director of department of dental and oral surgical prosthesis, army dental school.

Lieutenant Colonel Harold O. Scott proceed home and await retirement.

Captain David I. Edwards report to retiring board at Presidio of San Francisco for examination.—Army and Navy Register, January 6, 1923.

Colonels Alden Carpenter and Edwin P. Tignor having been found by Army retiring boards incapacitated for active service on account of disability incident thereto, their retirement from active service is announced; proceed home.—Army and Navy Register, December 23, 1922.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Dental Association, September 10-14, 1923, Cleveland, Ohio.

American Society of Orthodontists, April 9, 10, 11, 1923. Edgewater Beach Hotel, Chicago, Illinois.

American Medical Association, June 25 to 29, 1923, San Francisco, California.

American Academy of Periodontology, September 7 and 8, 1923, Statler Hotel, Cleveland, Ohio.

American Society of Oral Surgeons and Exodontists, September 4 to 7, 1923, Cleveland, Ohio.

National Society of Denture Prosthetists, August 27 to September 8, Cleveland, Ohio.

STATE SOCIETIES

February

Louisiana, at New Orleans (22, 23, 24.)

March

Michigan, at Detroit (27, 28, 29, 30, 31).
Vermont, at Burlington (21, 22, 23).

April

Alabama, at Birmingham (2nd Tuesday).
Connecticut, at Hartford (19, 20, 21).
Kentucky, at Louisville, (16, 17, 18, 19).
Kansas, at Wichita.
Mississippi, at Laurel (17, 18, 19).
Missouri, at St. Louis (16, 17, 18).
New Jersey, at Trenton (11, 12, 13).
North Carolina-Virginia, at Pinehurst, N. C., (April 30, May 1, 2, 3).
Texas, at Fort Worth (16-19).
Virginia, and North Carolina, at Pinehurst, N. C., (April 30, May 1, 2, 3).

May

Illinois, at Decatur (8, 9, 10).
Indiana, at Indianapolis (14, 15, 16, 17).
Iowa, at Des Moines (1, 2, 3).
Massachusetts, at Boston (2, 3, 4).
Nebraska, at Omaha (14, 15, 16, 17).
New York, at New York City, (9, 10, 11, 12).
Pennsylvania, at Philadelphia (15, 16, 17).
South Dakota, at Huron (10, 11, 12).
Tennessee, at Nashville (2, 3, 4, 5).
West Virginia, at Wheeling (21, 22, 23).

June

California, at San Francisco (11-15).
Colorado, Troutdale-in-the-pines, (14, 15, 16).
Idaho, at Boise.
New Hampshire, at The Weirs (21, 22).
Southern California, at Los Angeles.
Utah, at Salt Lake City.
Wyoming, at Loraine.

July

Montana, at Missoula.
Wisconsin, at Milwaukee (10, 11, 12).

MEETINGS OF STATE BOARD OF DENTAL EXAMINERS

Michigan, at Dental College, Ann Arbor, June 11 to 16 inclusive. Secretary, B. S. Sutherland, 401 Ward Building, Owosso.

Mississippi, at Capitol Building, Jackson, June 19. Secretary, B. J. Marshall, 6-7 Turner-Cox Building, Marks, Mississippi.

Texas, at Dallas, June 18 to 21 inclusive. Secretary, R. L. Rogers, Amarillo, Texas.

MEETING OF DENTAL HYGIENISTS' ASSOCIATION OF NEW YORK

The Dental Hygienists' Association of the State of New York, will hold its third annual meeting at the Hotel Commodore, New York City, on Monday and Tuesday, May 7 and 8, 1923. As the meeting of the Dental Society of the State of New York will be held at the same hotel, May 9 to 12, it is to be hoped that dentists and dental hygienists of New York and neighboring states, will attend both meetings. A cordial invitation is extended to all interested in oral hygiene, to attend the various clinics to be held on Tuesday afternoon, May 8. Details of the program will be published later.

ANNUAL MEETING OF MICHIGAN STATE DENTAL ASSOCIATION

MARCH 27, 28, 29, 30, 31, 1923
CASS TECHNICAL HIGH SCHOOL BUILDING, DETROIT, MICHIGAN

The Michigan State Dental Association this year is going to put on the most intensive and instructive program that has been attempted by any state or combination of states, and wishes to advise all members of the American Dental Association and the Canadian Dental Association that we will have a real co-operation in dental educational matters during that week.

There will be four distinct programs: 1. Dentists; 2. Dental nurses, hygienists and assistants; 3. Dental technicians; 4. Dentists' wives. These programs will be on different floors, and will not interfere one with another.

The Detroit Dental Clinic Club will demonstrate the subjects of: 1. Prosthodontia (Full and Partial); 2. Crown and Bridge; 3. Principles of Cavity Preparation for Gold and Porcelain Inlays; Principles of Impression Taking, Model Making and Articulation of Inlays and Crowns; 4. Porcelain (Crowns and Inlays); 5. Preventive Dentistry; 6. Root-Canal Surgery; 7. Oral Surgery.

An essayist from outside the state will read a short, snappy paper on each of the subjects demonstrated by the Clinic Club.

Essays on the subjects of conductive anesthesia, diseases of the jaws influenced by radium therapy, the possible value of pre-dental education and the value of co-operation between the dentist, the manufacturer and the distributor will be read.

Each essayist will clinic the subject matter of his clinic. We believe that each essayist should be available to the attendants so as to clear up questions, and so that the attendants can discuss with the essayist as an individual, thereby not necessitating the attention of the entire assembly at the time of the delivery of the essay.

A historical exhibit will be one of the features, more than worth while. Dr. William Bebb, Professor of Comparative Dental Anatomy, Librarian and Curator at the Northwestern University Dental School will bring a complete exhibit of the subjects to be demonstrated by the Clinic Club, will be a part of the section when demonstrating, and will interest the attendants in the history of the subject up to the present date. Dr. Bebb is noted the dental world over in this interesting field, and is very enthusiastic. The exhibit will be the most complete and extensive ever shown outside the museum.

The Defensive Diet League of America will be in attendance. This is a league that is interesting itself in properly balanced diet for us. G. E. Harter, Editor of The Dental Summary, will be in charge of this exhibit and it will be very instructive. A great deal of time has been spent in this very interesting study, and the results are quite a marvel.

The general clinics will be given the old-fashioned way—a free for all arrangement whereby the attendant may pick his clinics and move on at any time. The best men from all parts of the state are being secured as clinicians.

The spacious laboratories and recitation rooms afforded by the Cass Technical High School will give the clinicians unusual facilities which they heretofore have never enjoyed. It is planned that all subjects in dentistry will be demonstrated so that each attendant will get all of every phase of dentistry that he is looking for.

The building is very conveniently located, being seven minutes' walk from the hotel center of the city. It has seven floors (550,000 feet of floor space.) Five passenger elevators make it very comfortable for transportation. The auditorium has a seating capacity of 3065, and is fully equipped. It also has eight large assembly rooms, eighty-five recitation rooms and several ampitheatres.

Every laboratory facility possible that could be wished for the convenience of clinicians and demonstrators is to be had here.

There are lounge rooms on each floor for both men and women.

The dining room is a wonderful place, seating 1200 at one time and food will be served cafeteria style for cost both noon and evening.

A dinner-dance will be held at the Statler Hotel on Thursday evening, March 29 in honor of Doctor and Mrs. William A. Giffen.

One fare and one-half transportation rates have been arranged for, from all parts of the United States on certificate plan.

TUESDAY, MARCH 27, 1923

MORNING

Essays by M. M. House, "Prosthodontia."
E. C. Crummer, "Partial Dentures."
Wm. L. Shearer, "Surgery."

12:30—Noonday Speaker

AFTERNOON

Demonstrations by Detroit Dental Clinic Club.
Full Dentures; Partial Dentures, William A. Giffen, Director.

EVENING

R. Ottolengui, "Simple and Cystic Pericementomas and the Effect of Electrolytic Medication Thereon."
General Clinics by Michigan men.

WEDNESDAY, MARCH 28, 1923

MORNING

Clinics by essayists.
We believe that the time of the general assembly should not be taken with discussions, so each essayist will be available for discussions with individuals on this morning.

12:30—Noonday Speaker

AFTERNOON

One o'clock essay, Sam L. Silverman, "Conduction Anesthesia."
Balance of afternoon is exhibitors' half day.

EVENING

Public meeting in Auditorium. Nationally known public man for speaker. We feel at present that we will be able to arrange with Arthur Brisbane.

THURSDAY, MARCH 29, 1923

MORNING

Essays by Henry W. Gillett, "Indirect Inlays."
Fred A. Bricker, "Preventive Dentistry."

12:30—Noonday Speaker

AFTERNOON

Demonstrations by Detroit Dental Clinic Club.

"Principles of Cavity Preparation for Gold and Porcelain Inlays."

"Principles of Impression Taking, Model Making and Articulation of Inlays and Crowns"—E. B. Spalding, Director.

"Preventive Dentistry"—Grace Spalding, Director.

EVENING

Dinner-dance in honor of Doctor and Mrs. William A. Giffen at Statler Hotel. Otto U. King, Speaker of the evening.

FRIDAY, MARCH 30, 1923

MORNING

Essays by C. C. Sparrow, "Crown and Bridge."

George A. Thompson, "Porcelain."

Frank H. Taylor, "Co-operation."

12:30—Noonday Speaker

AFTERNOON

Demonstrations by Detroit Dental Clinic Club.

"Crown and Bridge"—Wm. H. Elliott, Director.

"Porcelain Crown and Inlays"—A. L. Le Gro, Director.

EVENING

R. E. Loucks, " Diseases of the Mouth and Jaws Influenced by Radium Therapy."

General Clinics.

SATURDAY, MARCH 31, 1923

MORNING

Demonstrations by Detroit Dental Clinic Club.

"Root-Canal" Raymond L. Girardot,—Director.

"Surgery"—Don M. Graham, Director.

There will be a complete program for the nurses, hygienists and assistants, technicians and for the dentists' wives. Committees are enthusiastically working on the details.

Miss Edith Constable, who is in charge of Board of Health Nurses, is in charge of the Committee for nurses, hygienists and assistants.

A. A. Nelson, the well-known prosthodontist, is in charge of the program of the technicians.

Mrs. Wm. R. Alvord, past president of the Michigan Federation of Women's Clubs, is in charge of the program for the dentists' wives.

These committee heads are very ably assisted. The completed program will be published later.

The Michigan State Dental Association is particularly keen this year to have real audiences for these meetings, and are putting enthusiastic effort into the arrangements.

MISSOURI STATE DENTAL ASSOCIATION

The fifty-eighth annual meeting of the Missouri State Dental Association will be held at the Statler Hotel, St. Louis, Missouri, April 16, 17 and 18, 1923. A cordial invitation is extended to all ethical practitioners of Missouri and other states. Admission to all literary meetings and clinics may be secured by presentation of card indicating membership in State and American Association Societies. Literary meetings and clinics will be held at the Statler Hotel. A large general clinic will be featured.

Make your hotel reservations early.

J. P. MARSHALL,
Chairman Publicity Com.
Maplewood, Mo.

B. O. HAUN,
Wall Building, St. Louis.

VAL H. FREDERICH,
Arcade Building, St. Louis.

THE DENTAL SOCIETY OF THE STATE OF NEW YORK

The fifty-fifth annual meeting of The Dental Society of the State of New York will be held at the Hotel Commodore, New York City, May 9, 10, 11 and 12, 1923. A cordial invitation is extended to all ethical practitioners, residents of New York and sister states. Admission to all literary meetings and clinics will be secured by presentation of cards disclosing membership in State and American Dental Association Societies. All literary exercises, clinics, and exhibits will be staged in the Hotel Commodore.

The Executive Council for the transaction of business will convene Tuesday, May 8, at 3:00 P. M.

The exhibits will be in charge of Exhibits Committee, H. C. Bennett, chairman, 376 Fifth Avenue, New York City. Exhibitors please address Dr. Bennett for further information. Exhibitors desiring space should secure same without delay.

Stephen Palmer, 272 Mill Street, Poughkeepsie, New York, chairman of the Clinic Committee, solicits voluntary clinics.

Every effort is being put forth to make the 55th meeting in all respects the most attractive and memorable in the history of the society.

Hotel reservations should be made direct with the hotel management. For further information and programs address

A. P. BURKHART, *Secretary,*
89 Genesee St., Auburn, N. Y.

LOUISIANA STATE DENTAL SOCIETY

A Mid-Winter Clinic will be held under the auspices of the Louisiana State Dental Society, February 22, 23 and 24, 1923, at the Grunewald Hotel, New Orleans, Louisiana. Several men of national repute will take part in this meeting.

For further particulars address,

J. P. WAHL, *Chairman Publicity Committee,*
New Orleans, La.

TEXAS STATE DENTAL SOCIETY MEETING

The Texas State Dental Society will hold its forty-third annual convention at Fort Worth, Texas, April 16 to 19, 1923.

For space, exhibitors will please address W. H. Nugent, F. & M. Bank Bldg., Fort Worth, Texas.

J. G. FIFE, *Secretary-Treasurer,*
1813 Main St., Dallas, Tex.

MEETING OF MICHIGAN STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Michigan State Board of Dental Examiners, for examinations, will be held at the Dental College, Ann Arbor, Michigan, June 11 to 16 inclusive, 1923. For further information, address

B. S. SUTHERLAND, *Secretary,*
401 Ward Bldg., Owosso, Michigan.

MEETING OF TEXAS STATE BOARD OF DENTAL EXAMINERS

The Texas State Board of Dental Examiners will hold their next examination in Dallas, Texas, June 18 to 21 inclusive, 1923. No reciprocity.

R. L. ROGERS, *Secretary,*
Amarillo, Texas.

MEETING OF MISSISSIPPI STATE BOARD OF DENTAL EXAMINERS

The Mississippi State Board of Dental Examiners will hold its regular annual meeting in the new Capitol Building, Jackson, June 19, 1923. Applications for dentists' and dental hygienists' examinations should reach the secretary ten days before the meeting. For further information and blanks, address

B. J. MARSHALL, *Secretary,*
6-7 Turner-Cox Bldg., Marks, Miss.